

## **Head-Up : co-designing novel neck orthosis for neck weakness in MND**

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# headup

**NHS**

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Sheffield Teaching Hospitals **NHS**  
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Excellence as standard



# Motor Neurone Disease

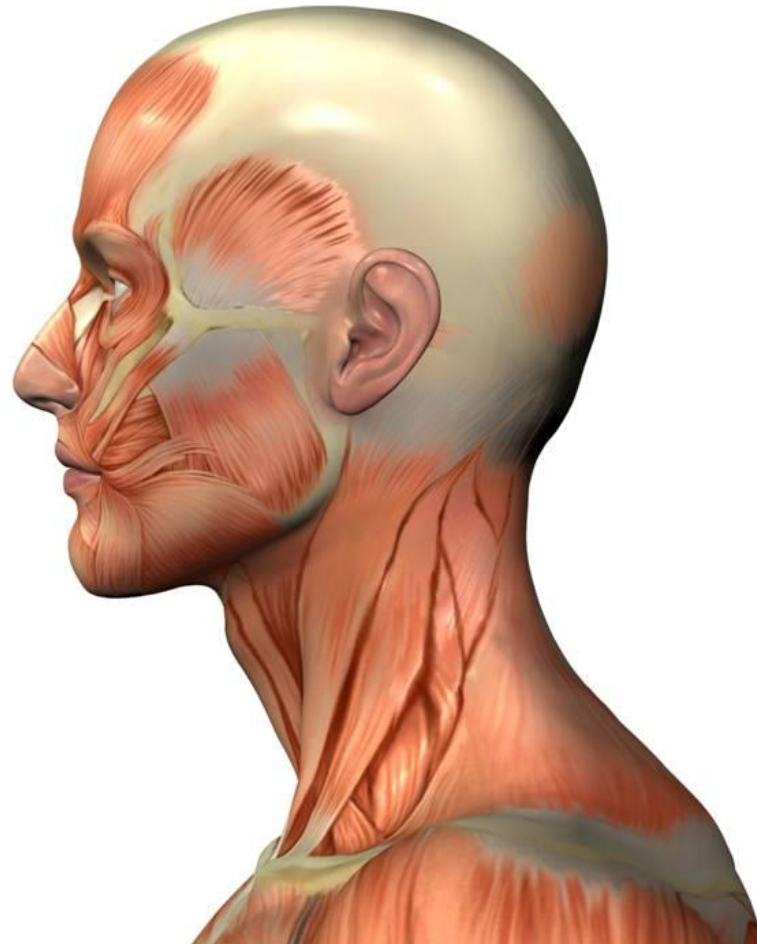








# Introduction







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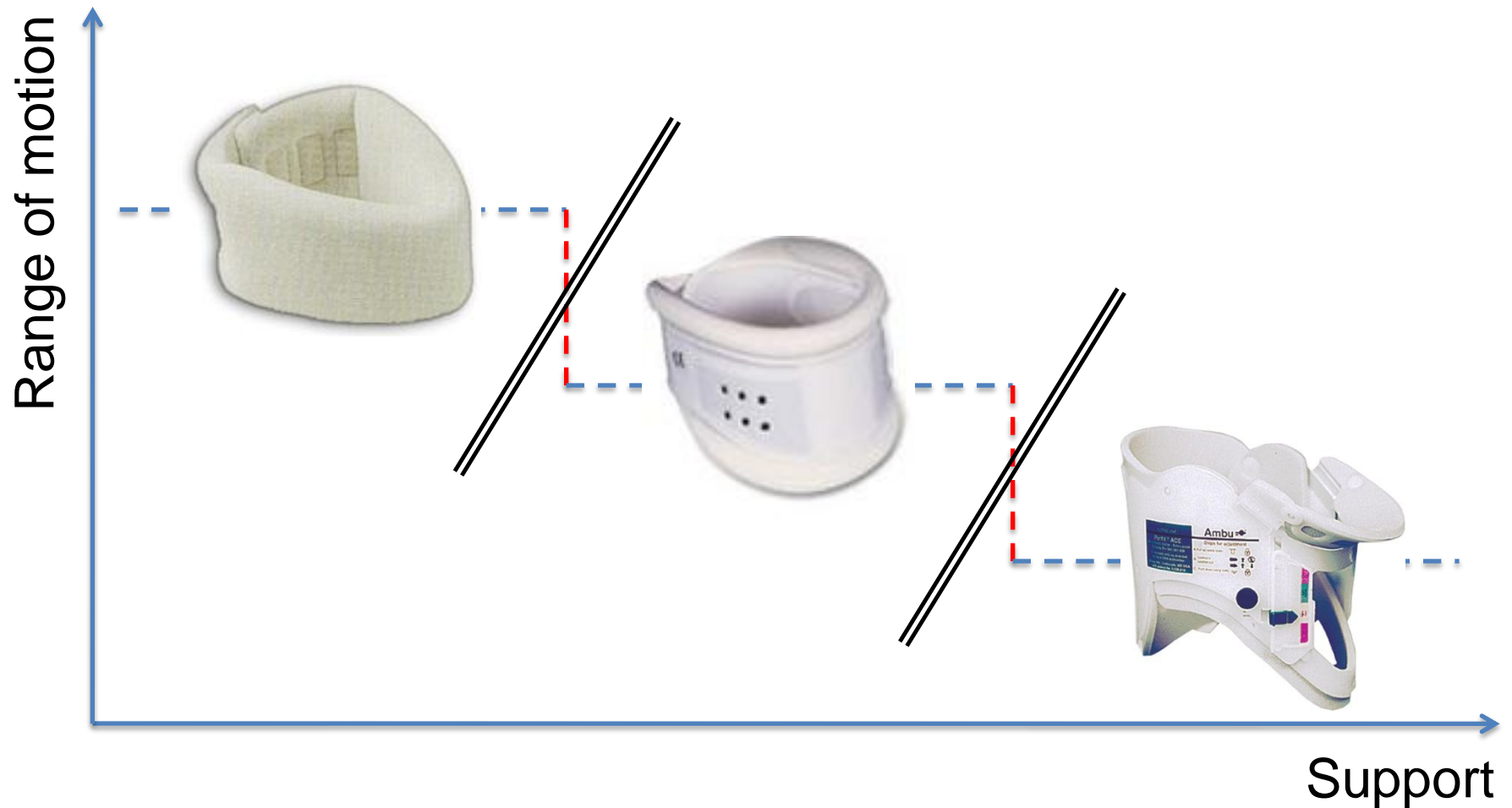






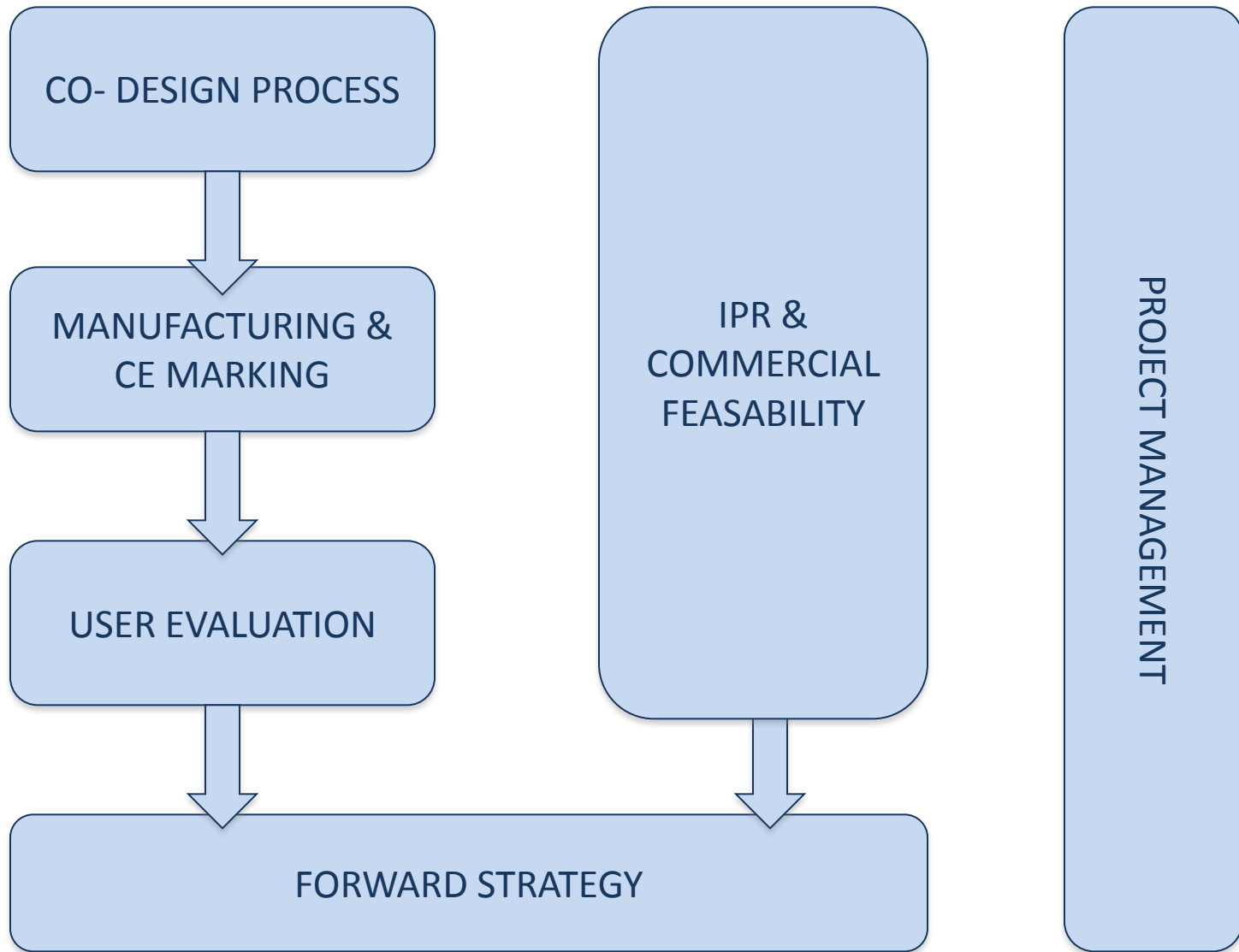


## Disease progression



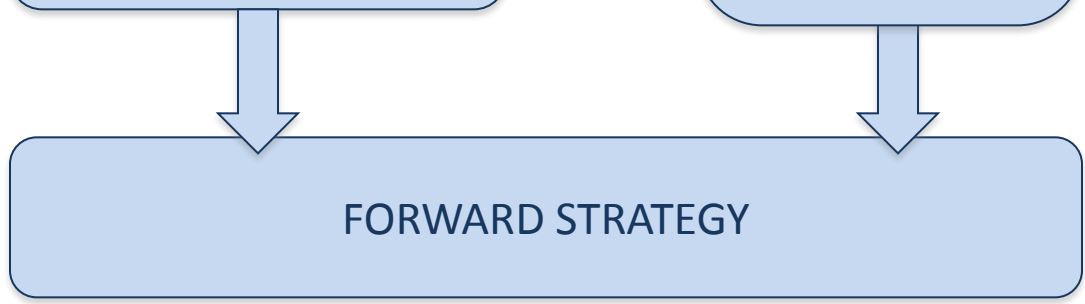
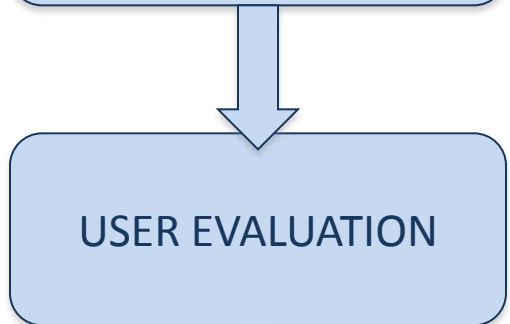
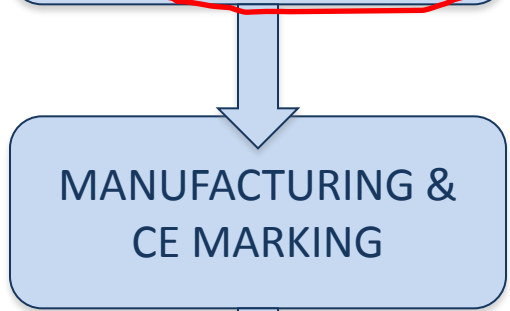


# Project Plan





# Project Plan







Comfort and pain means different things to different people

How do we compare the subjective feedback from different people when you only have a small group of carers and patients?





# Comfort Assessment

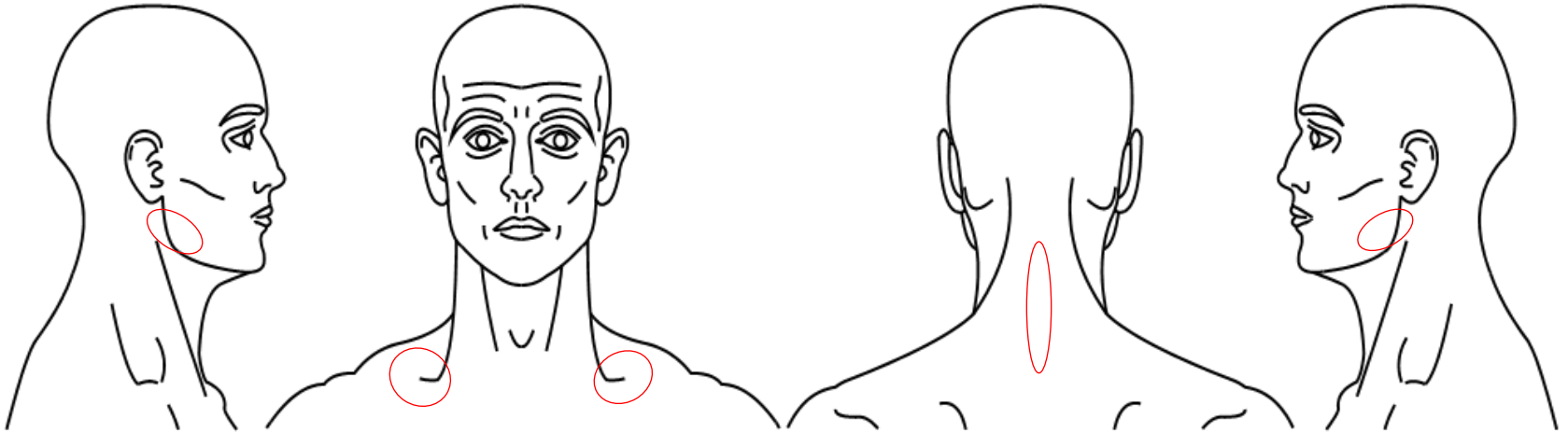




# Comfort Assessment

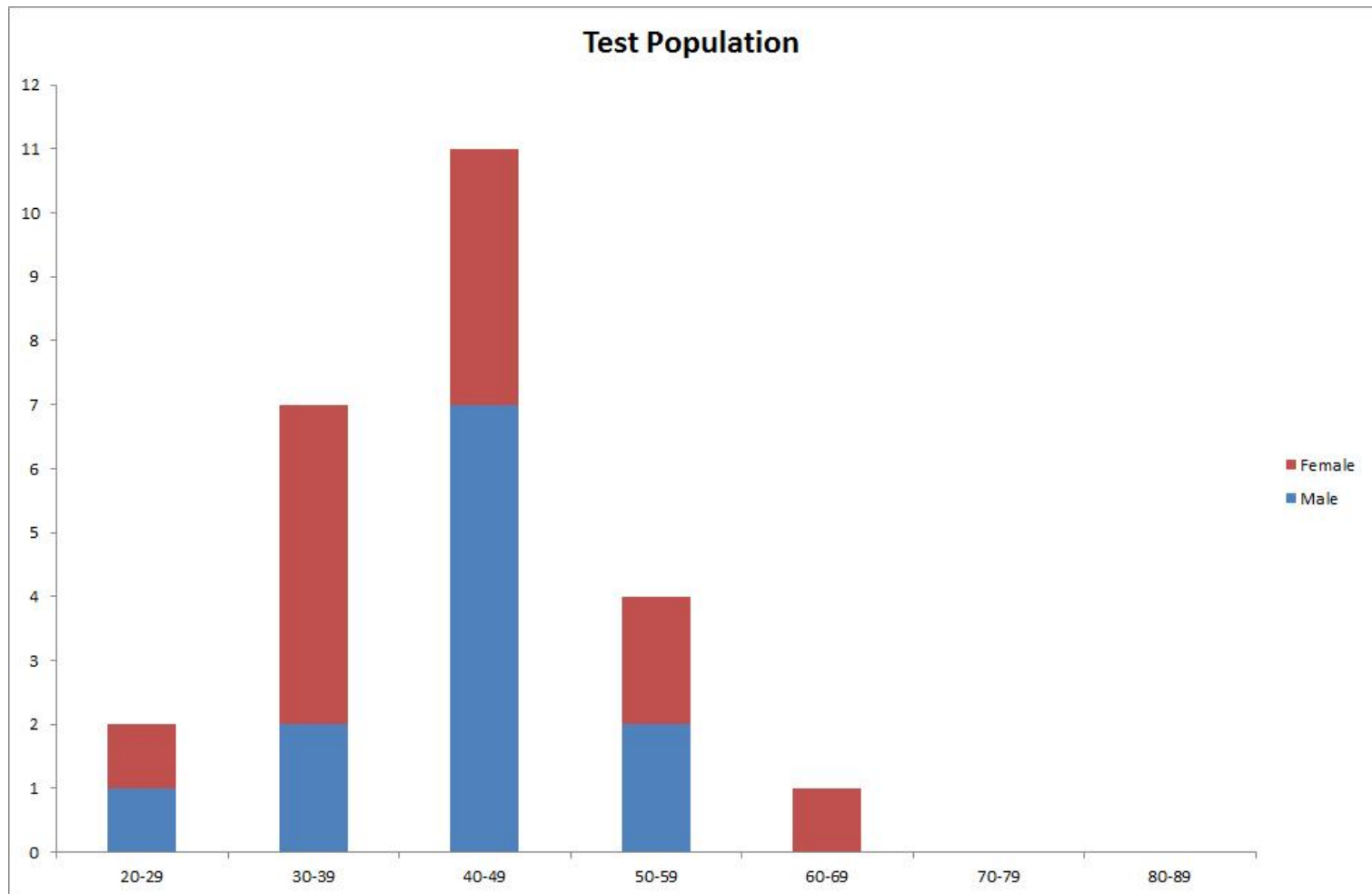


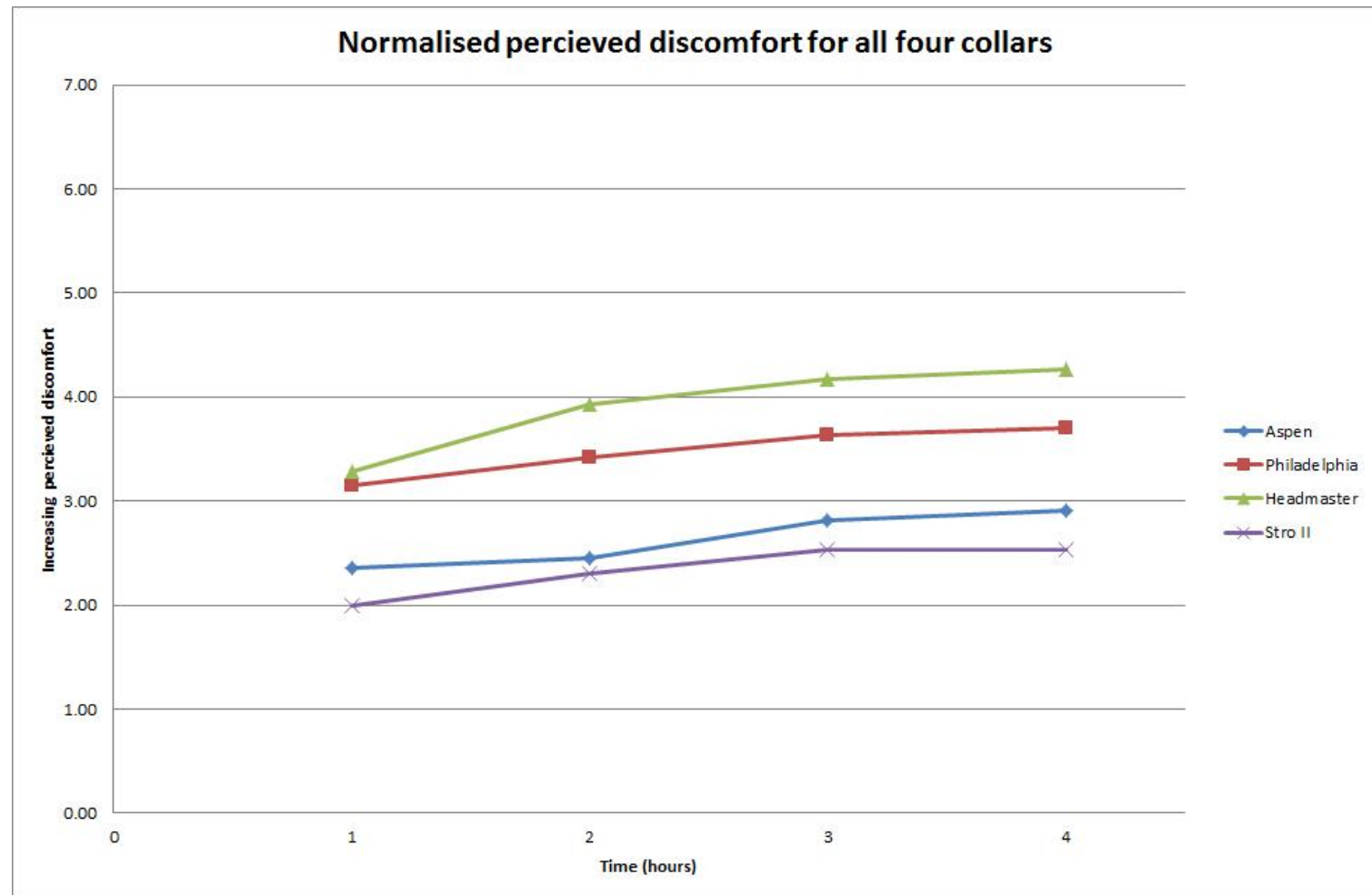
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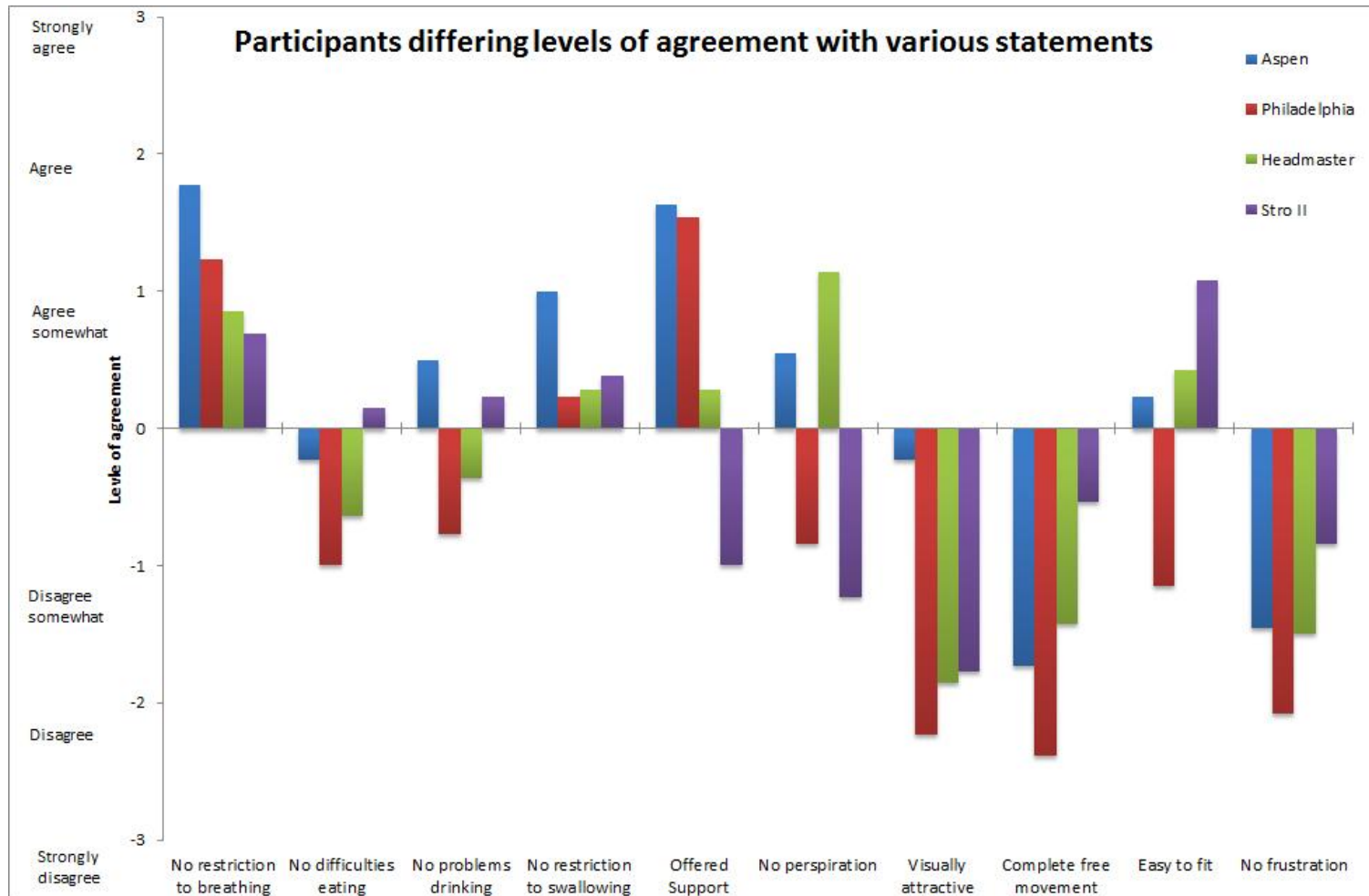




# Comfort Assessment

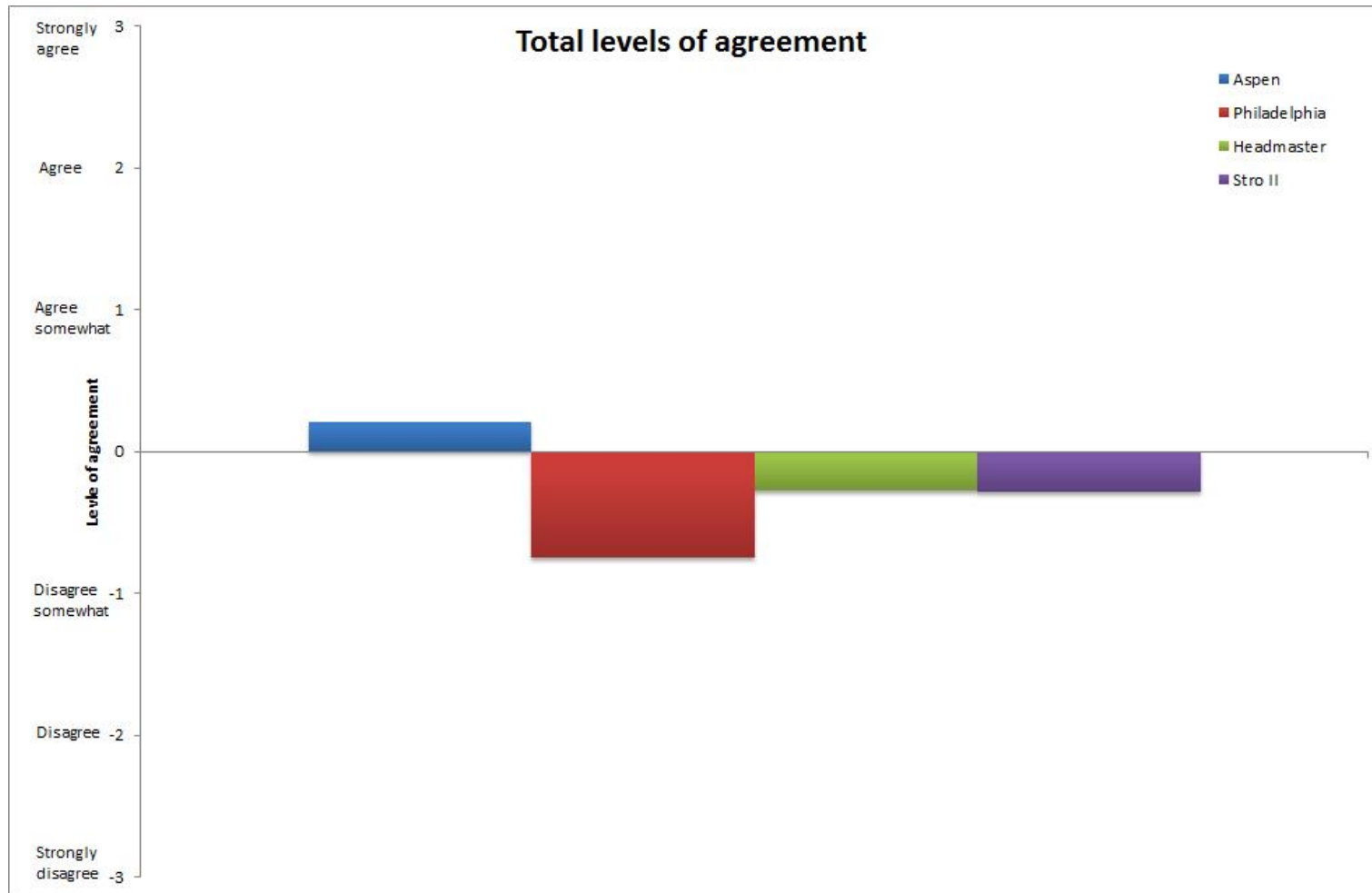








# Comfort Assessment



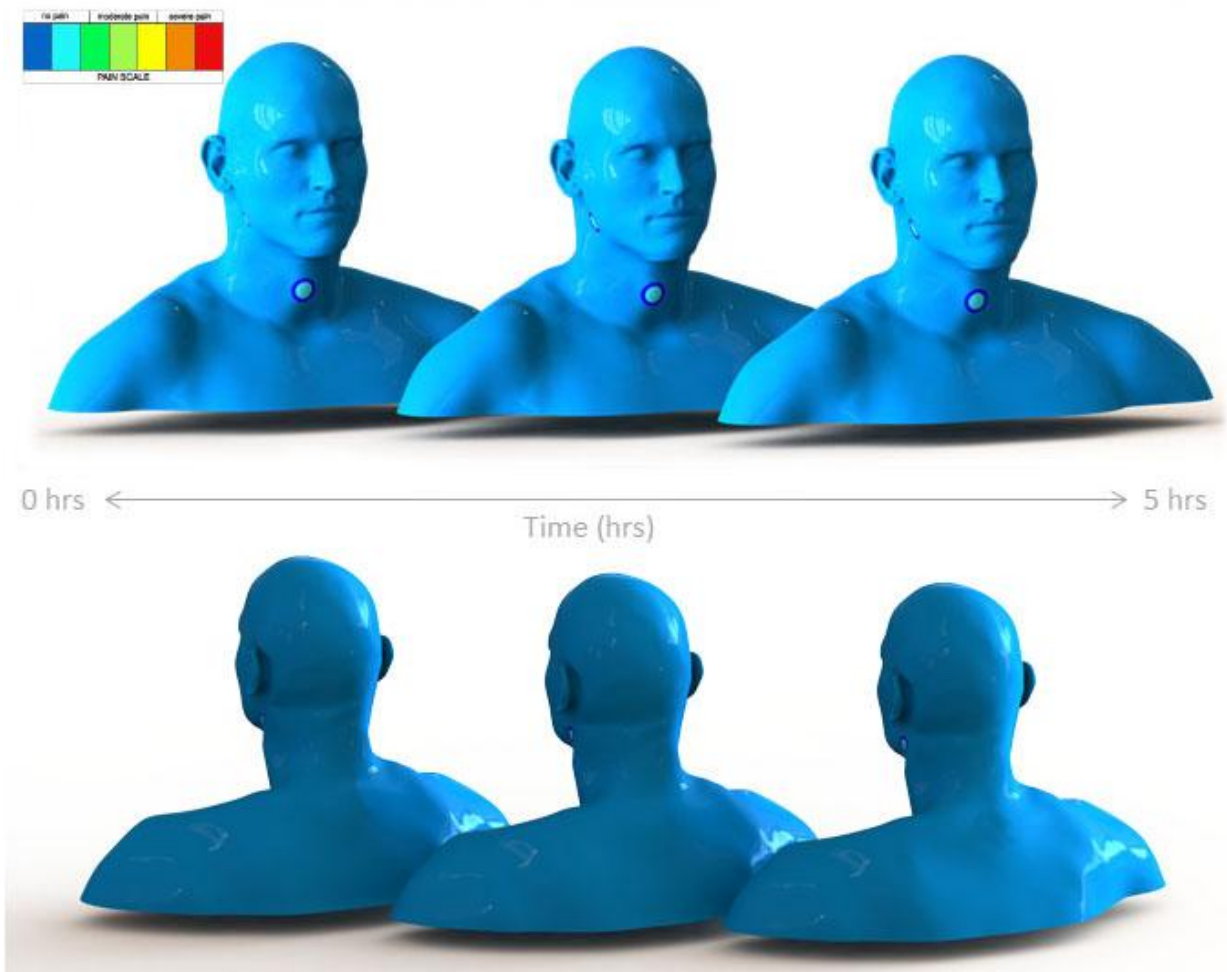


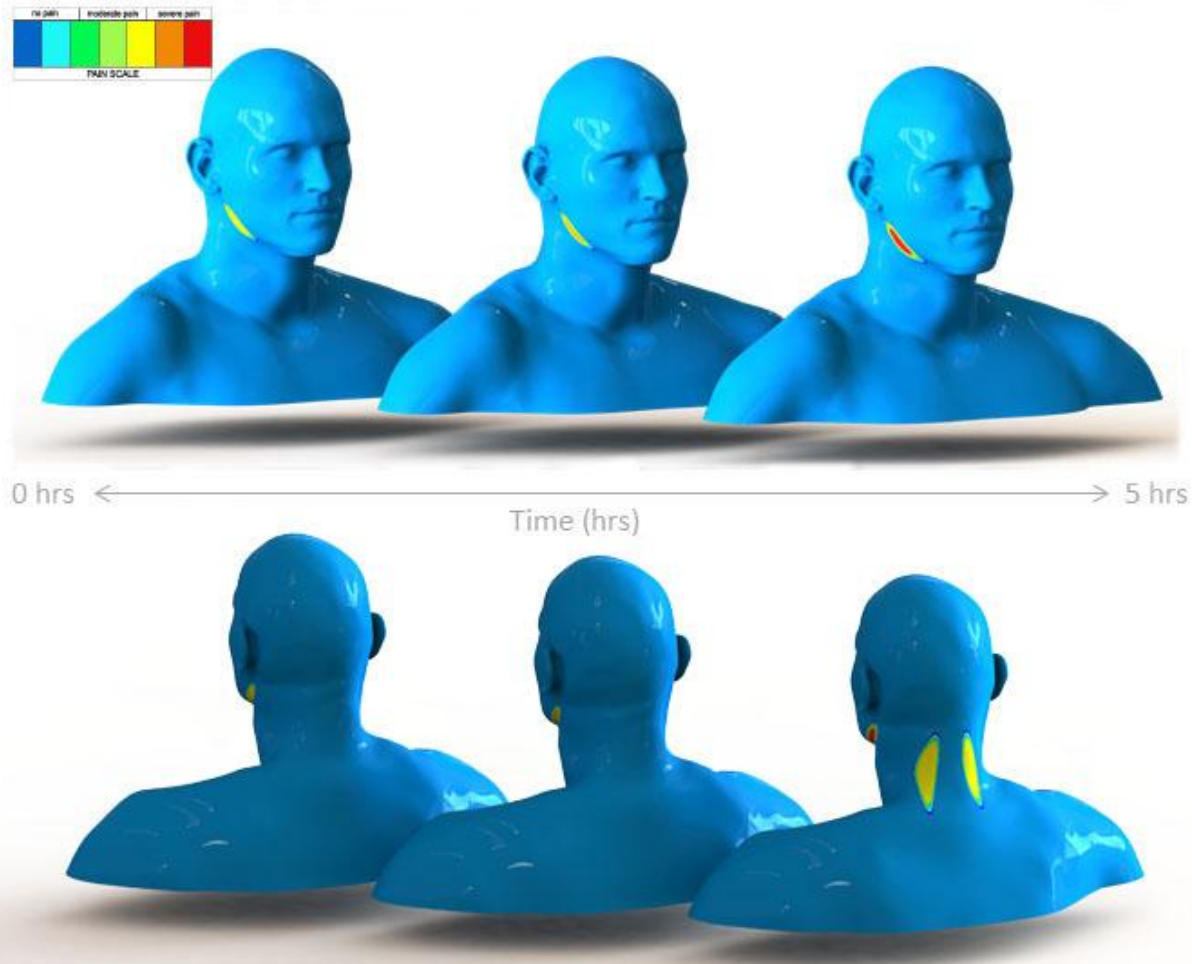


## Results

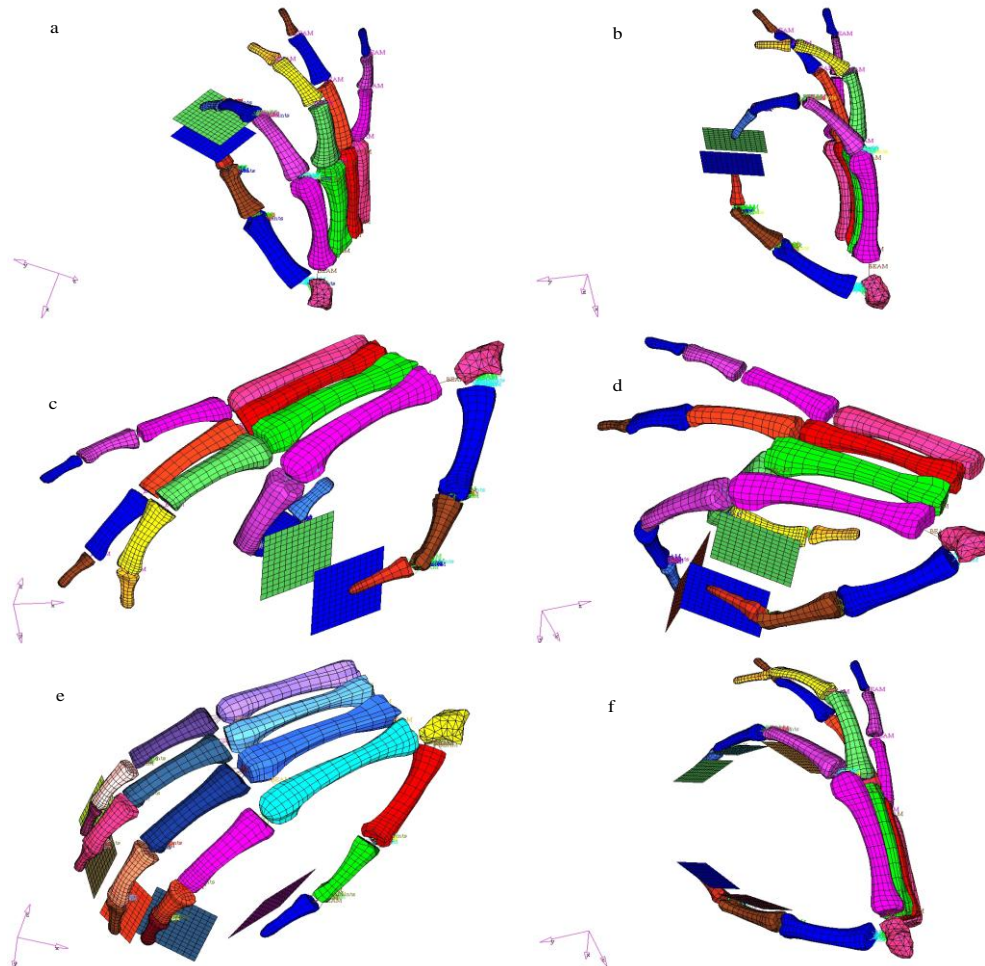


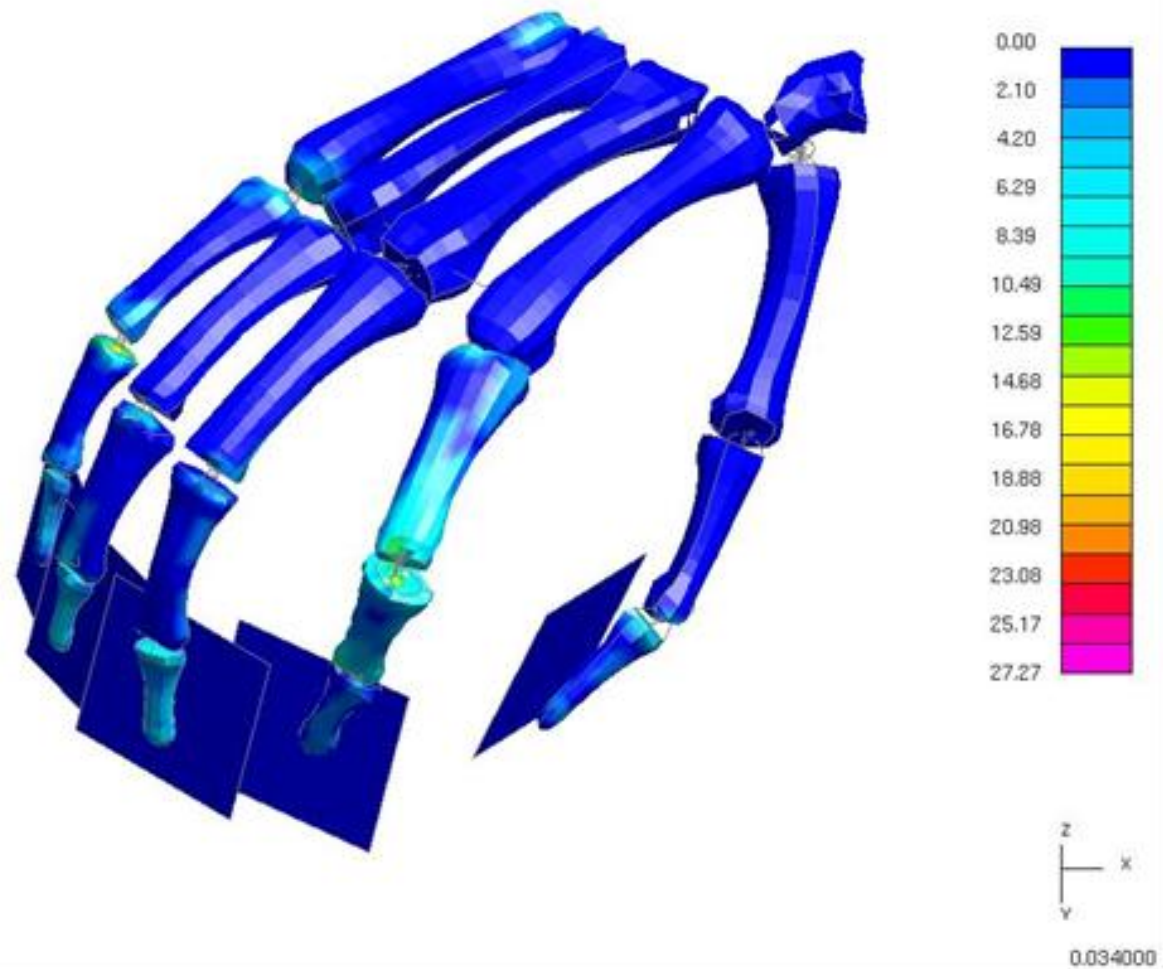
Stro II





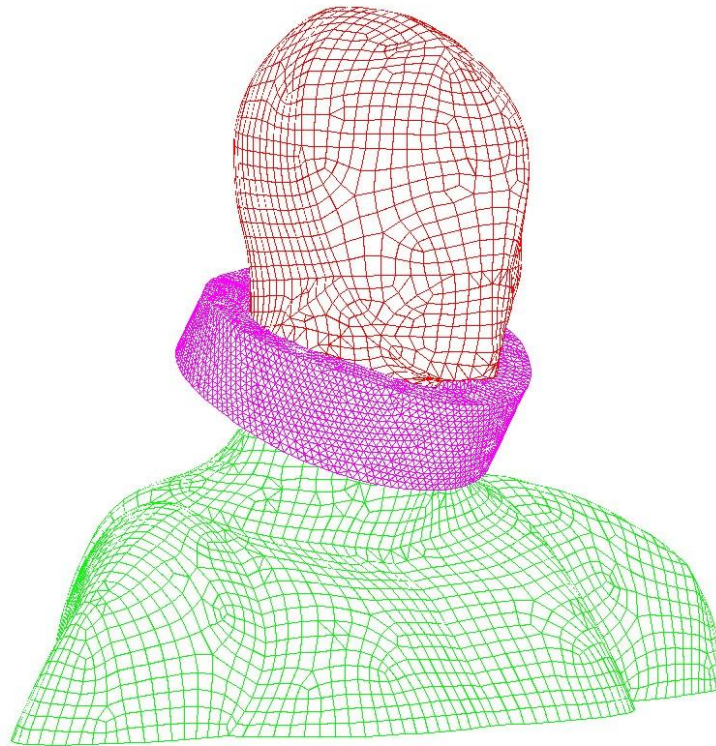
Philadelphia







D3PLOT: M1 + M2

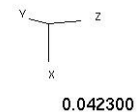


Y — Z  
|  
X  
0.00000000

D3PLOT: M1 + M2

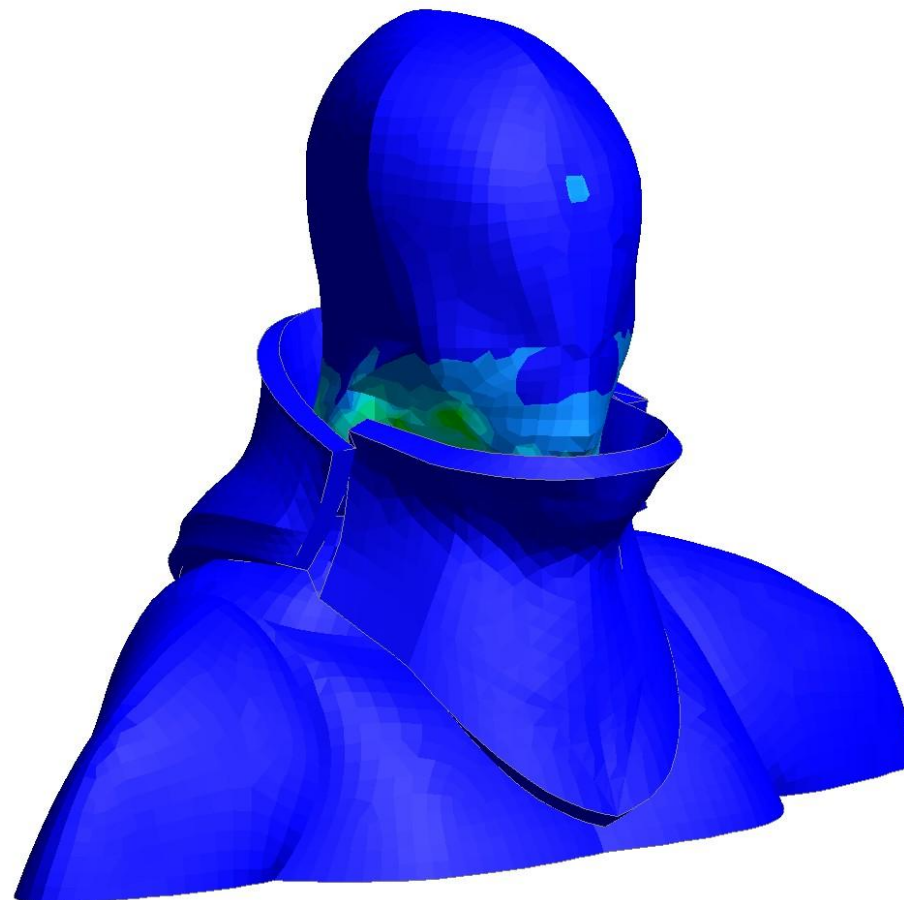


VON\_MISES\_STRESS  
(Top intg pt)

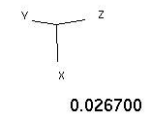




D3PLOT: M1 + M2



VON\_MISES\_STRESS  
(Top intg pt)



- All collars increase discomfort against time
- Trade-off between movement and support
- Unintuitive fitting

- Developed 'empathetic' methodology
- Visual recording method for pain and discomfort
- Relating subjective user feedback to numerical models



## Conclusions

“Although I cannot move and I have to speak through a computer, in my mind I am free.”

- Stephen Hawking



**Thank you**

**Dr Joe Langley**

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**[www.lab4living.org.uk](http://www.lab4living.org.uk)**