

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

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### **Citation:**

LANGLEY, Joe, REED, Heath, STANTON, Andrew, MCDERMOTT, Chris, HERON, Nicola, CLARKE, Zoe, JUDGE, Simon and SHAW, Pamela (2012). Head-Up : co-designing novel neck orthosis for neck weakness in MND. In: RAatE 2012, University of Warwick, 26 November 2012. Coventry University HDTI. [Conference or Workshop Item]

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headup

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Hallam  
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University  
Of  
Sheffield.



Sheffield Teaching Hospitals **NHS**  
NHS Foundation Trust  
Excellence as standard





# Motor Neurone Disease



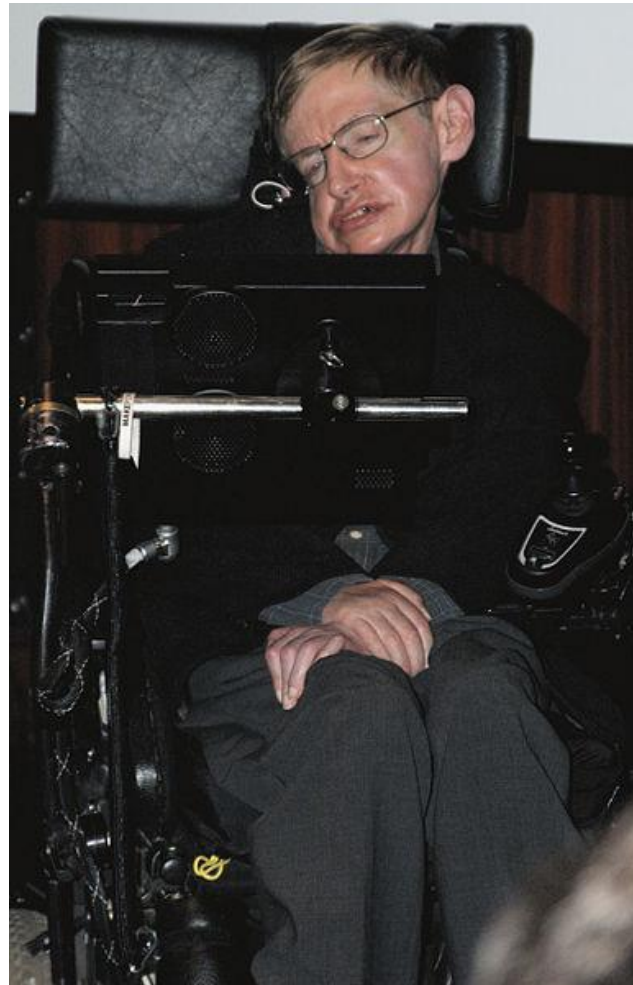


# Introduction



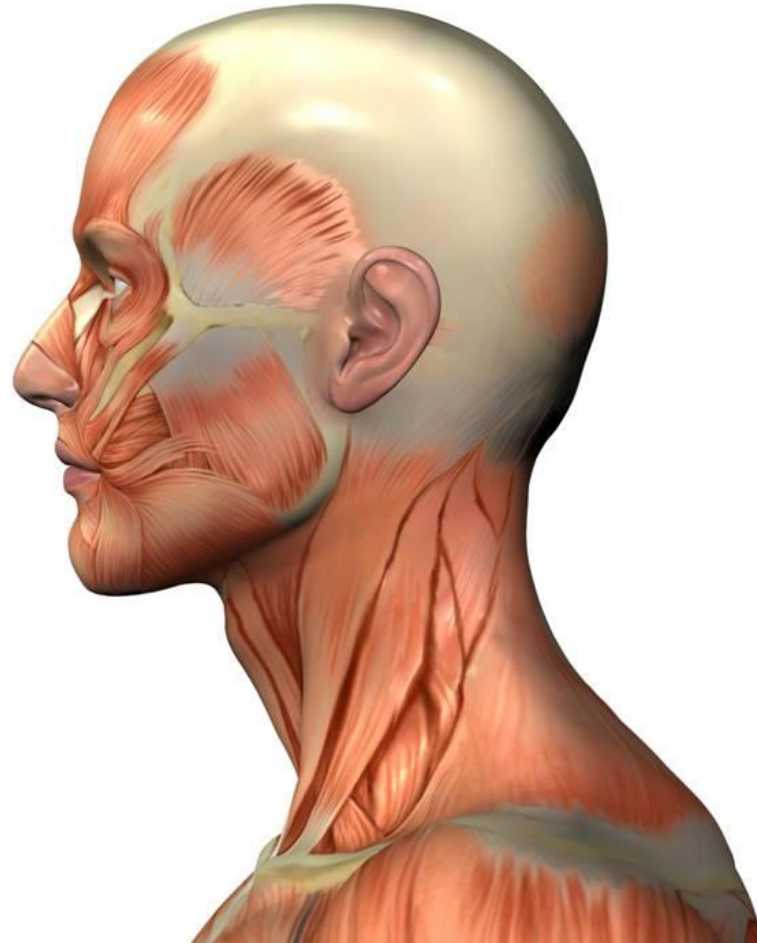


# Introduction





# Introduction





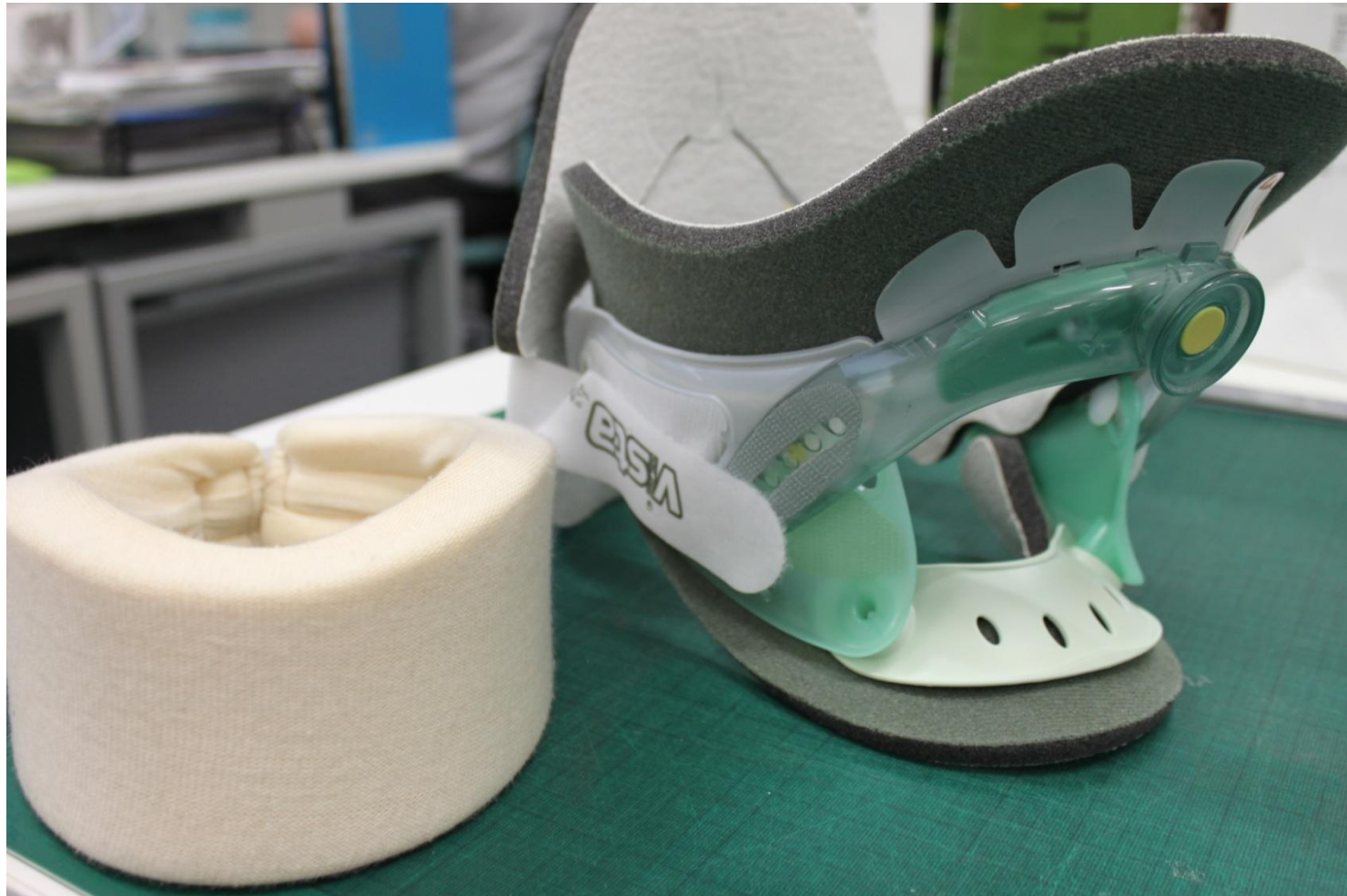
# Introduction







# Current Provision

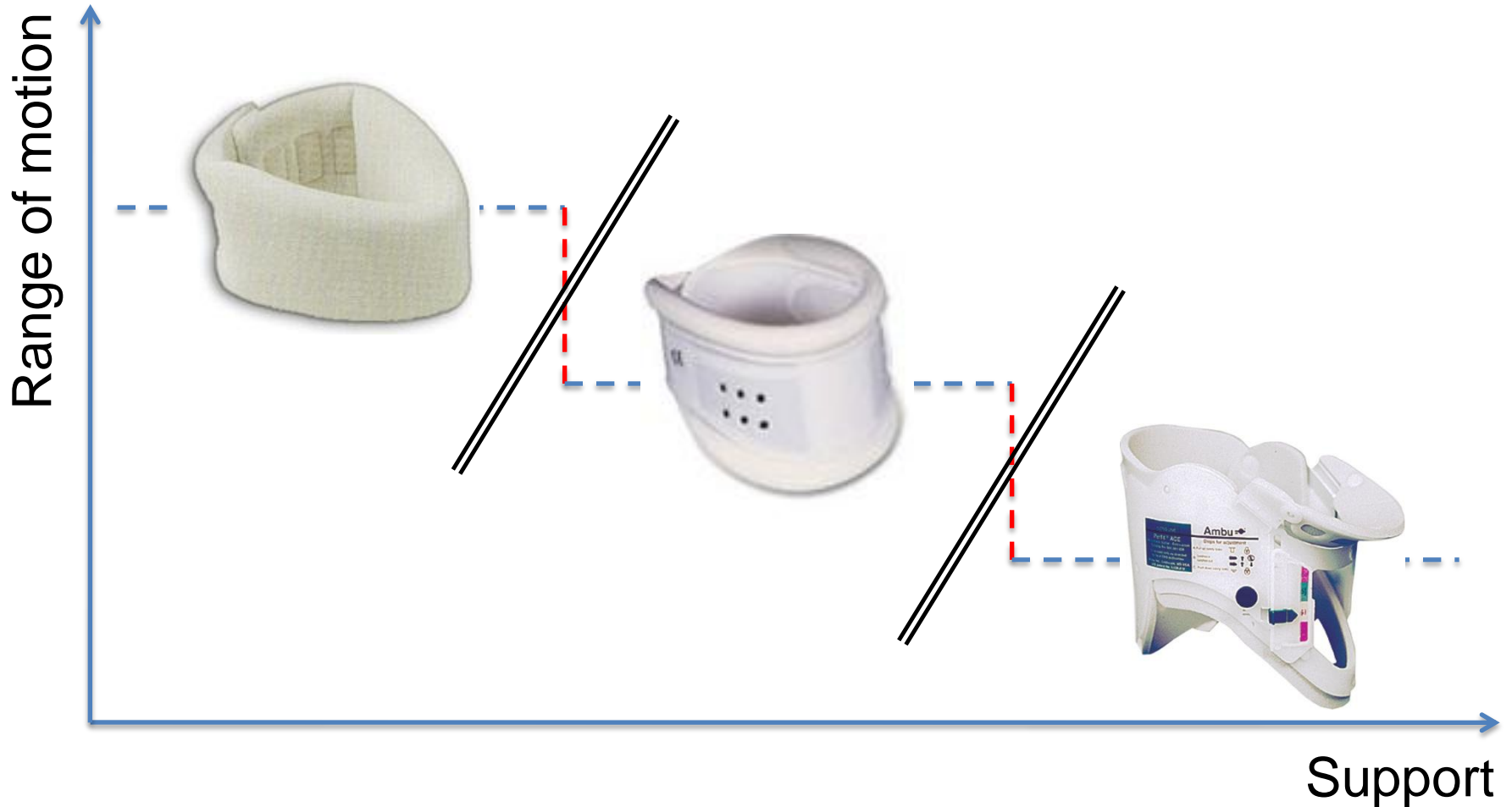




# Current Provision

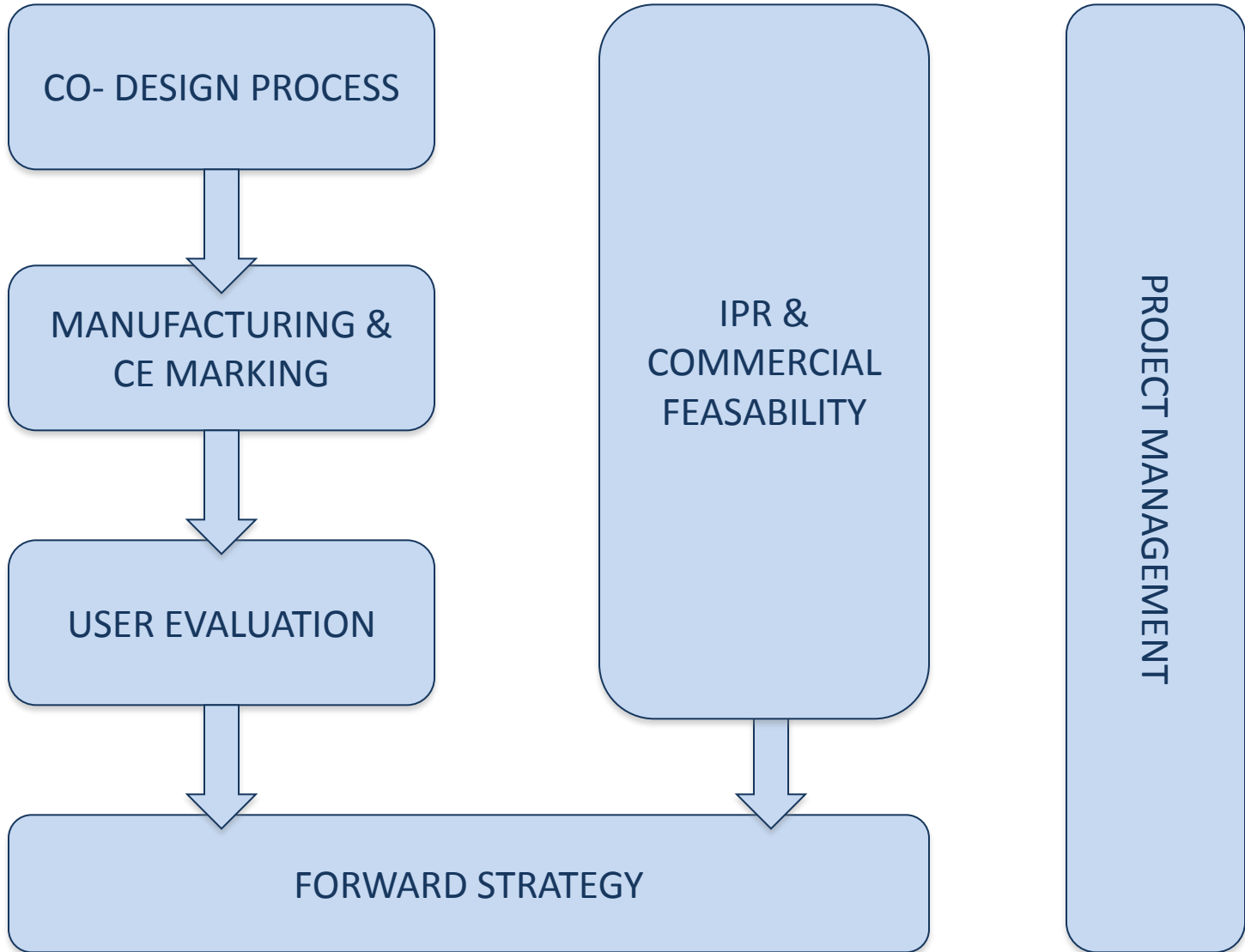


# Disease progression



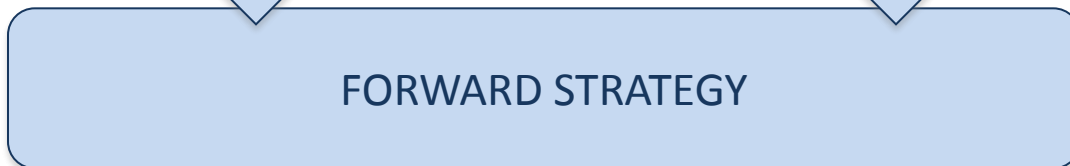
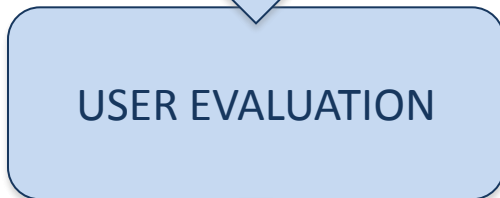


# Project Plan





# Project Plan





# Co-design





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

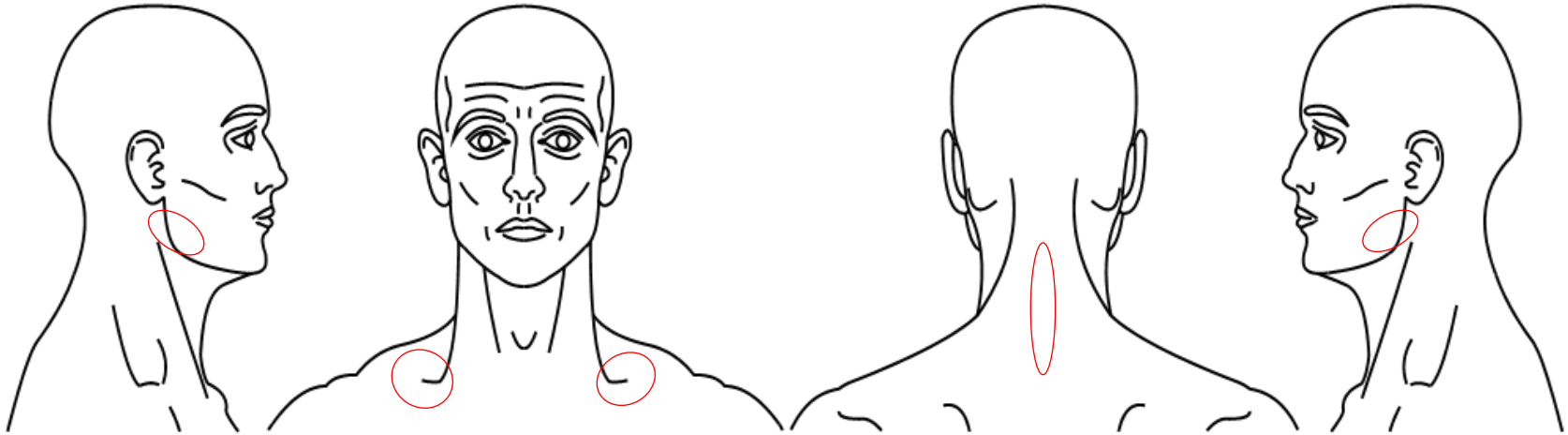






# Comfort Assessment





No discomfort

A little discomfort

Very uncomfortable

Extremely uncomfortable

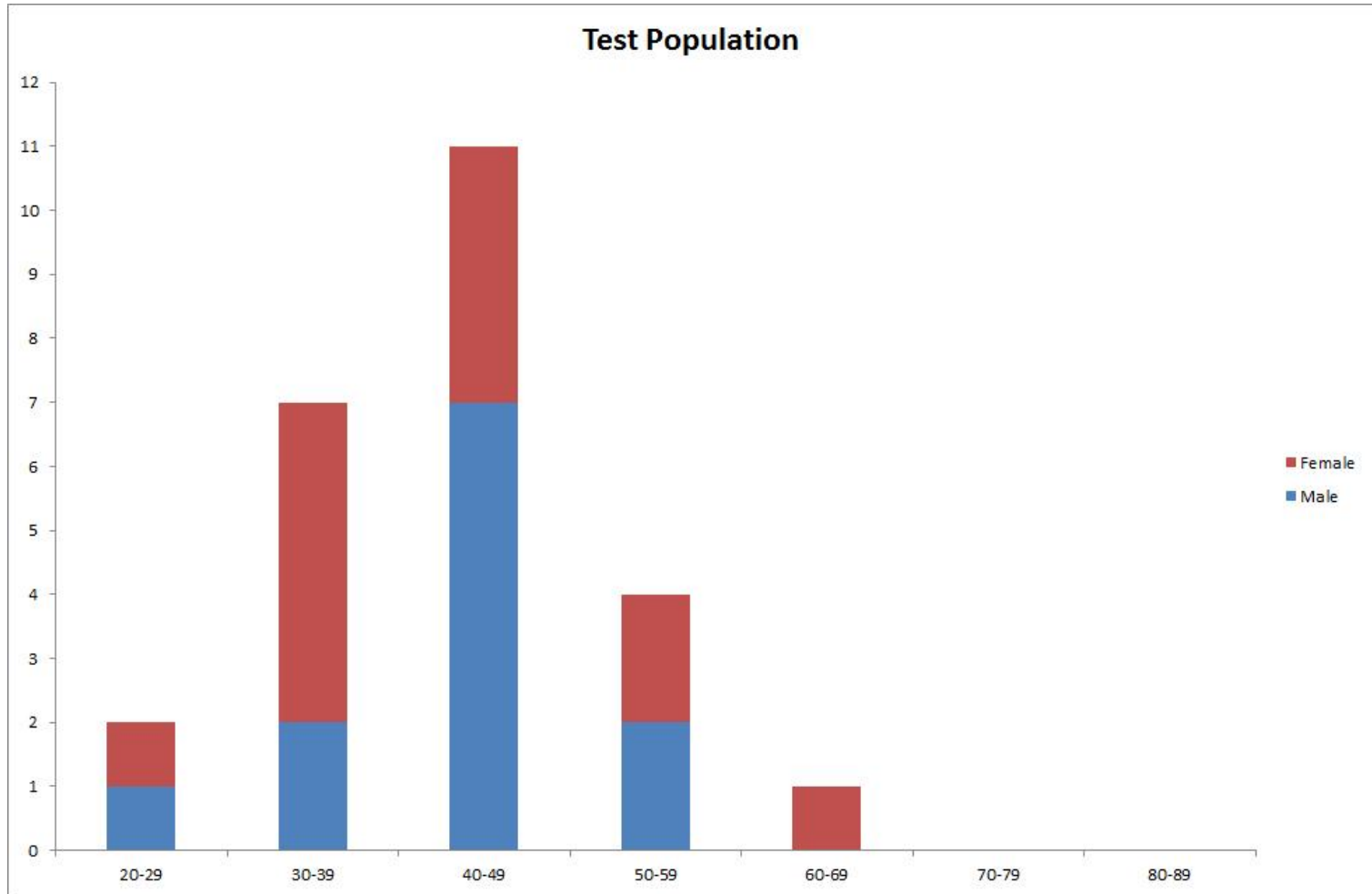
A little painful

Very painful

Severe Pain

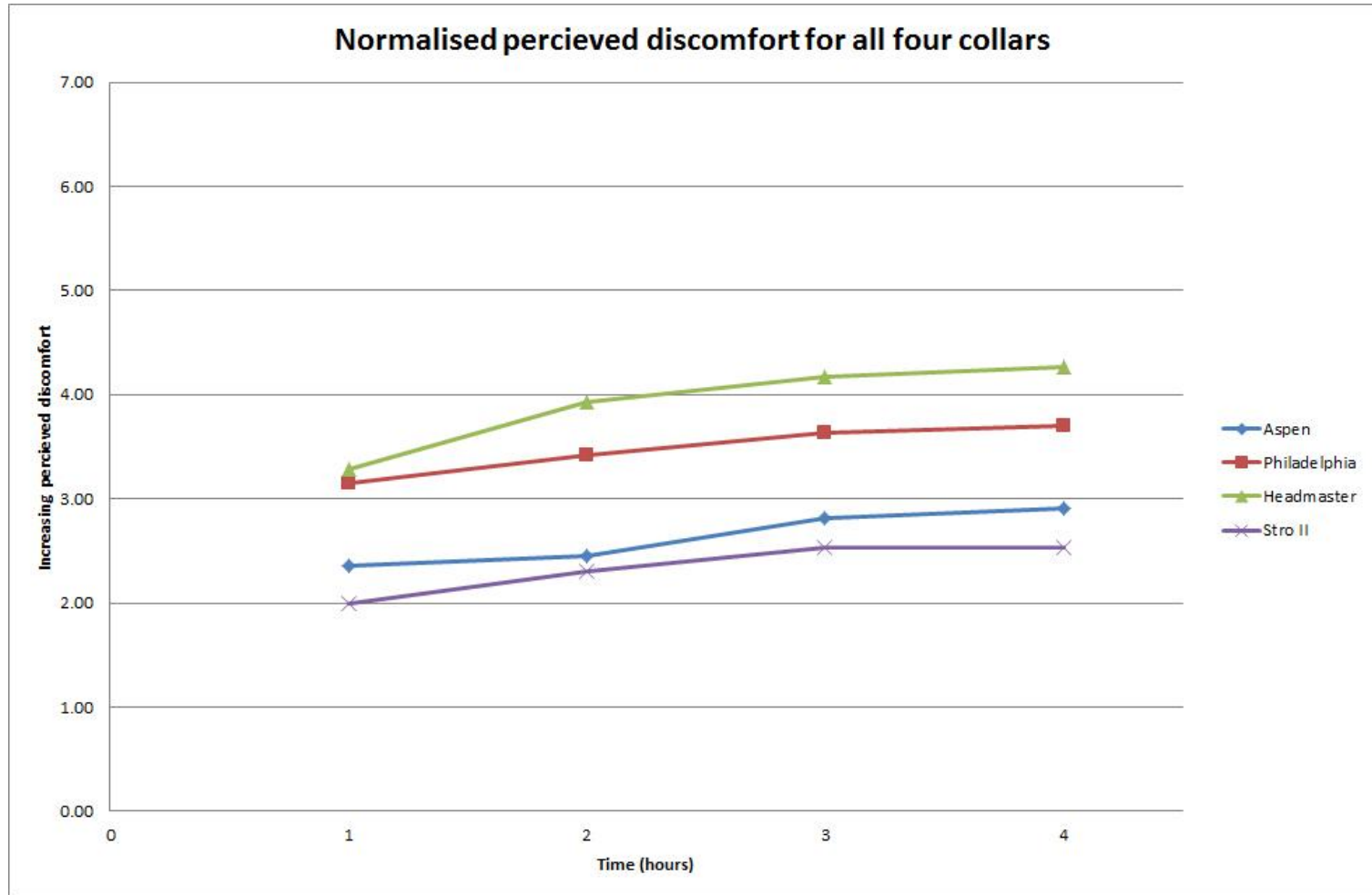


# Comfort Assessment



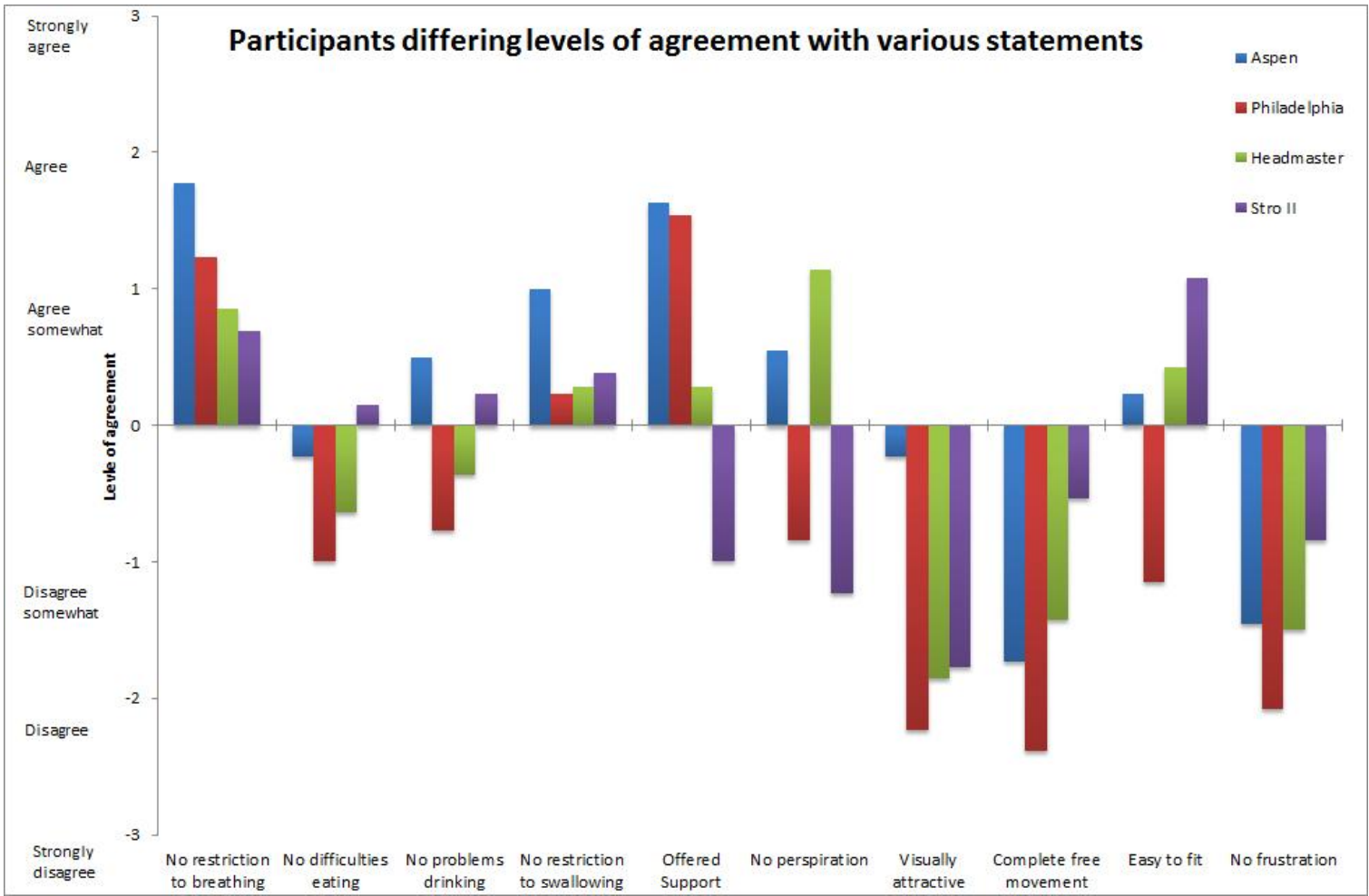


# Comfort Assessment



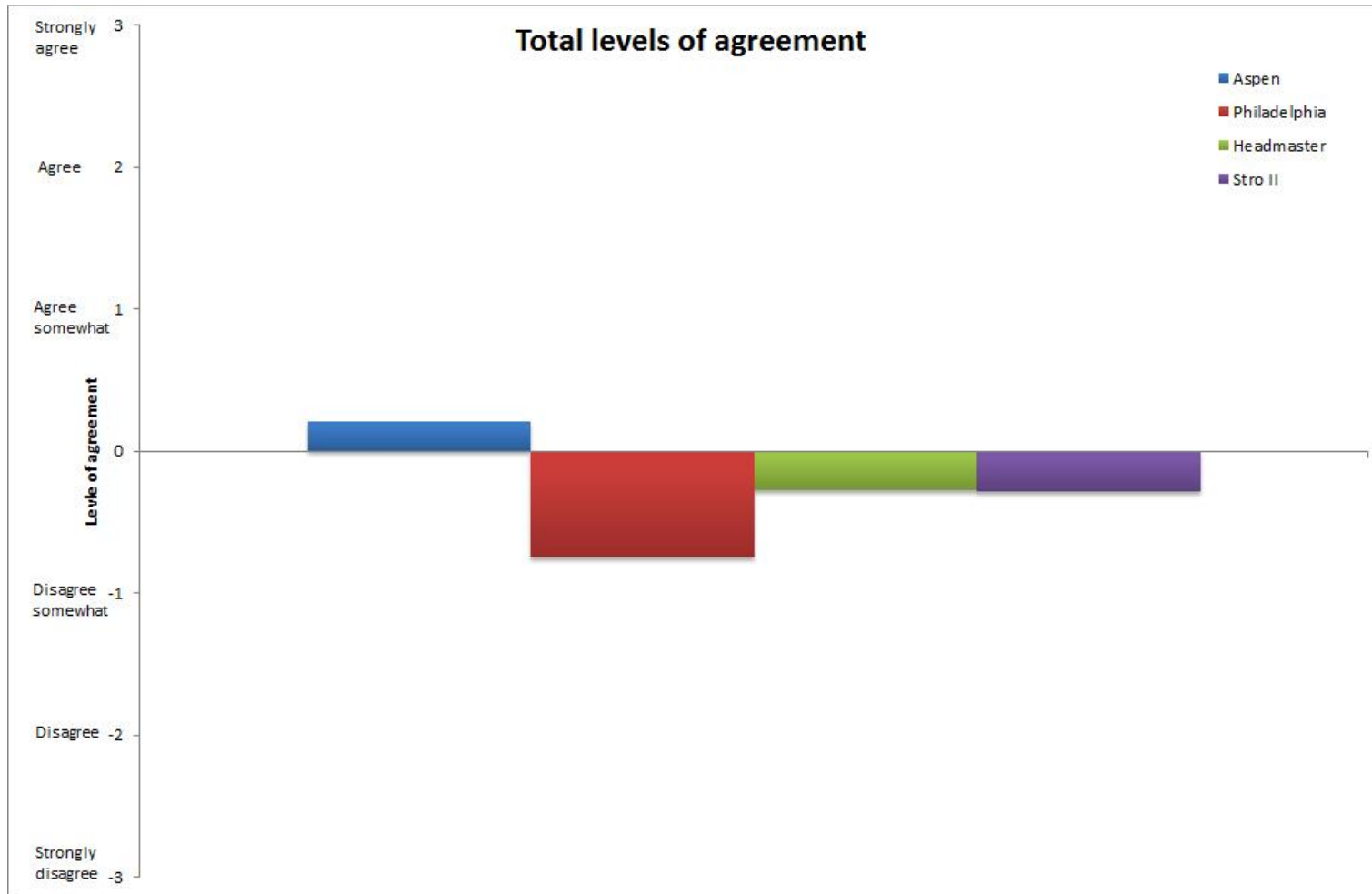


# Comfort Assessment





# Comfort Assessment





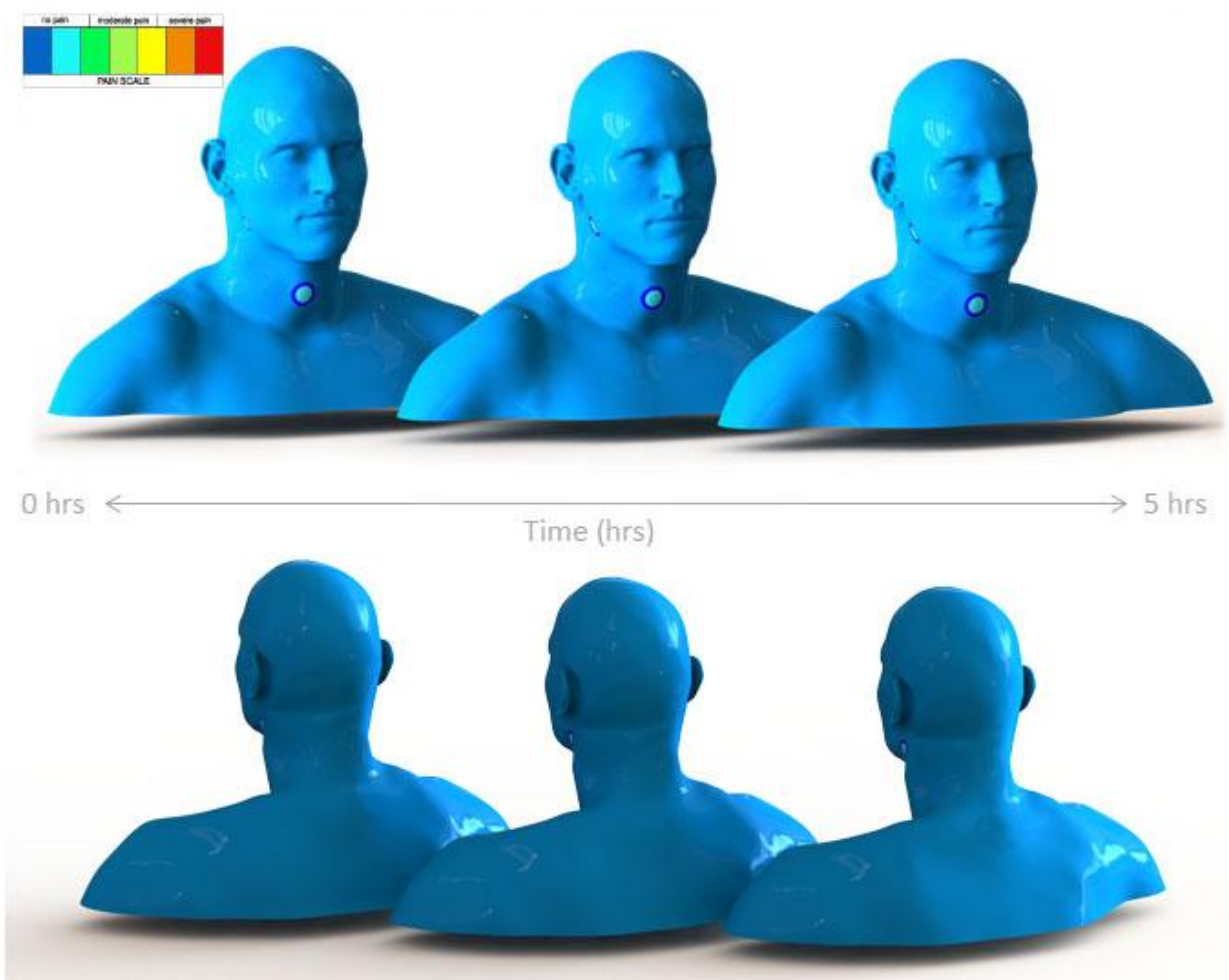
# Results





# Results

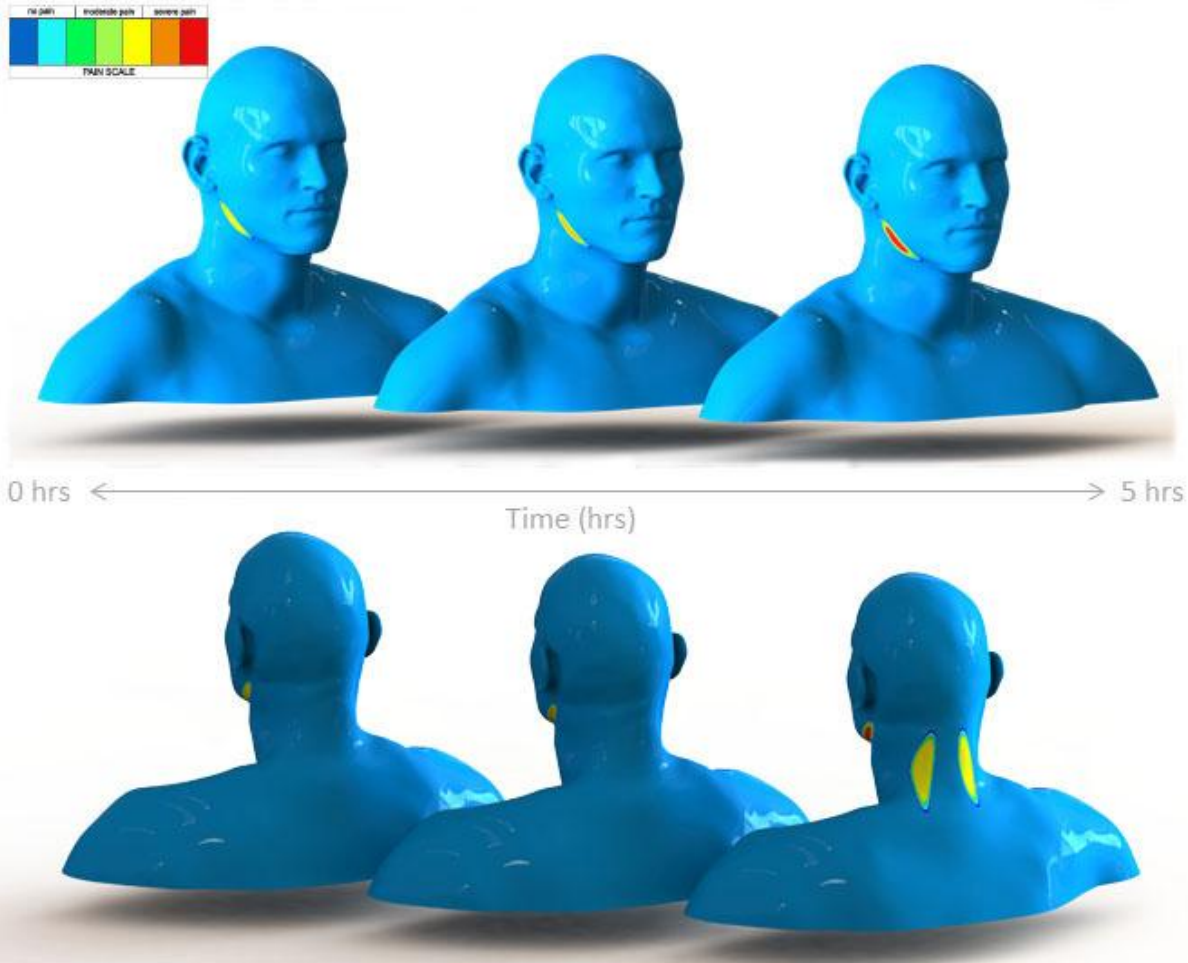
Stro II





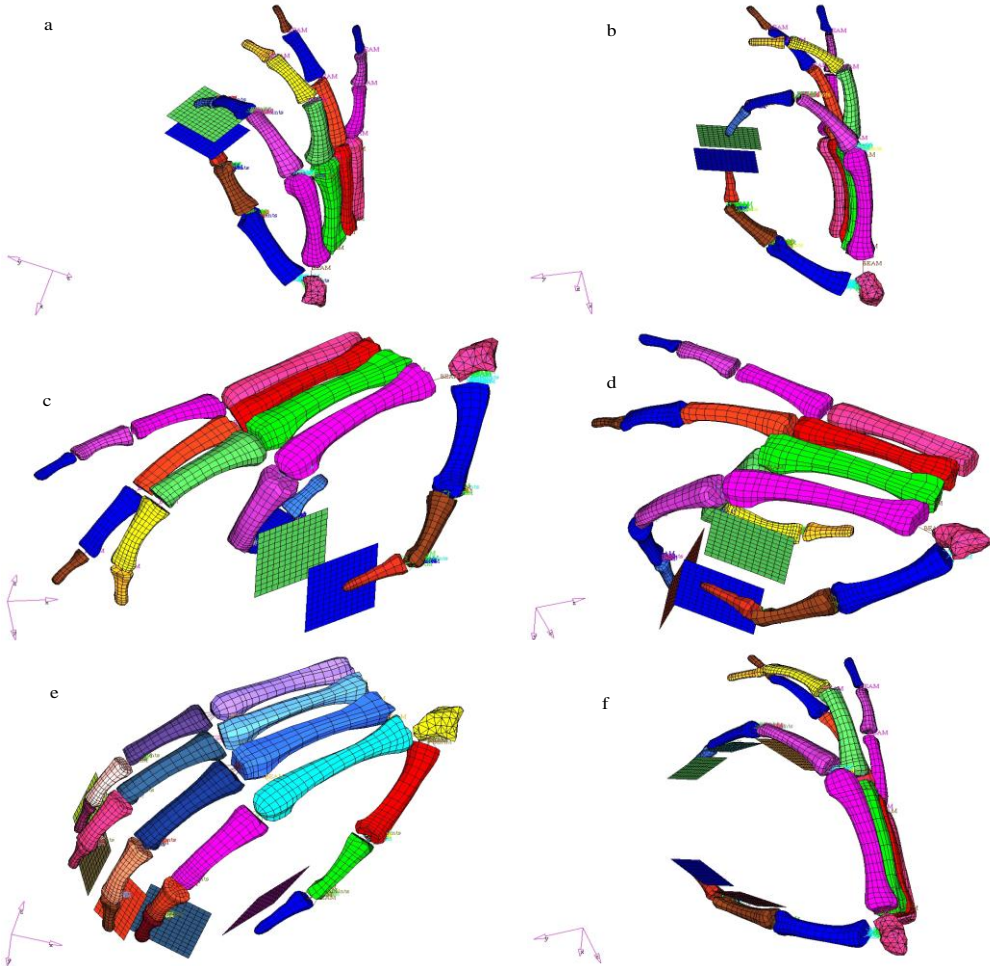


# Results



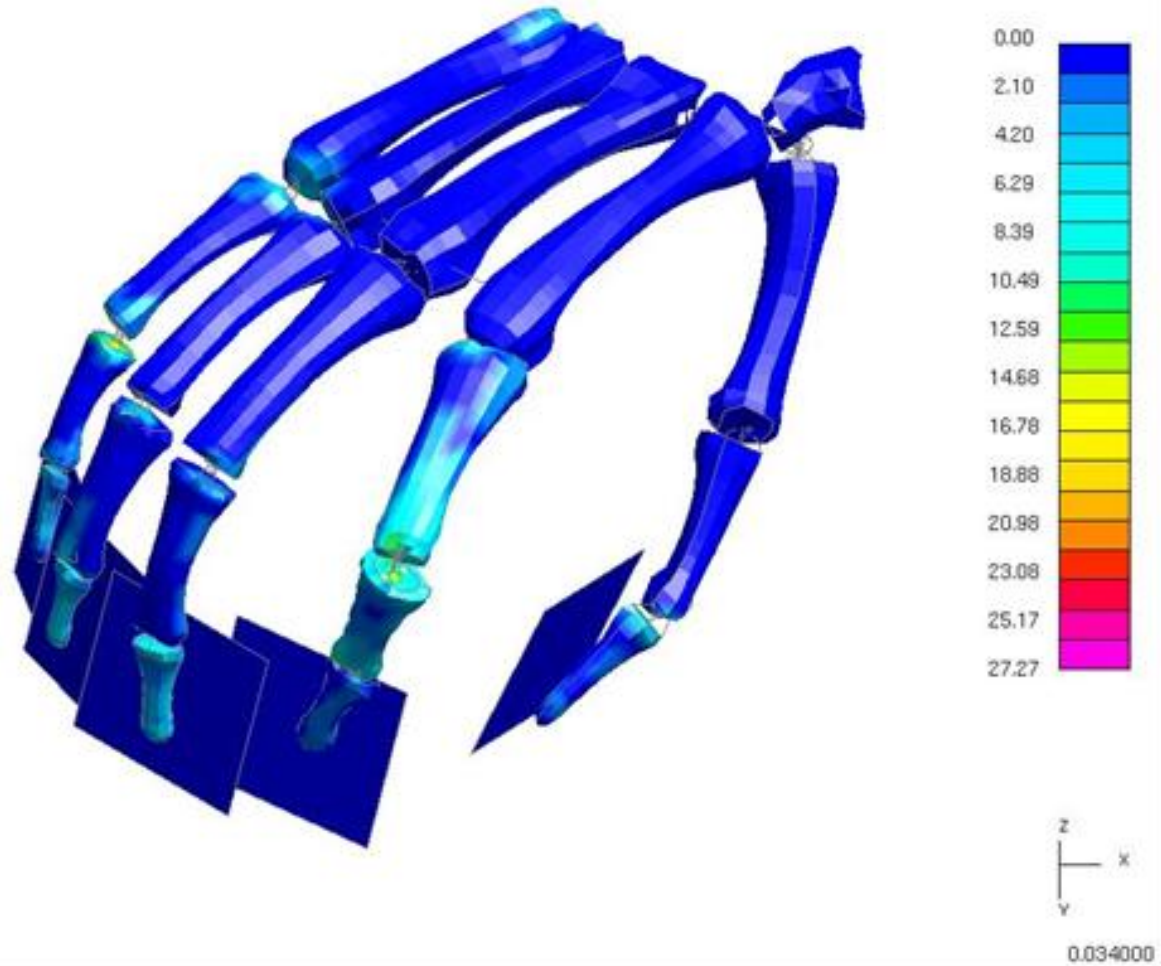


# Neck Weakness



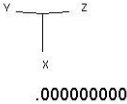
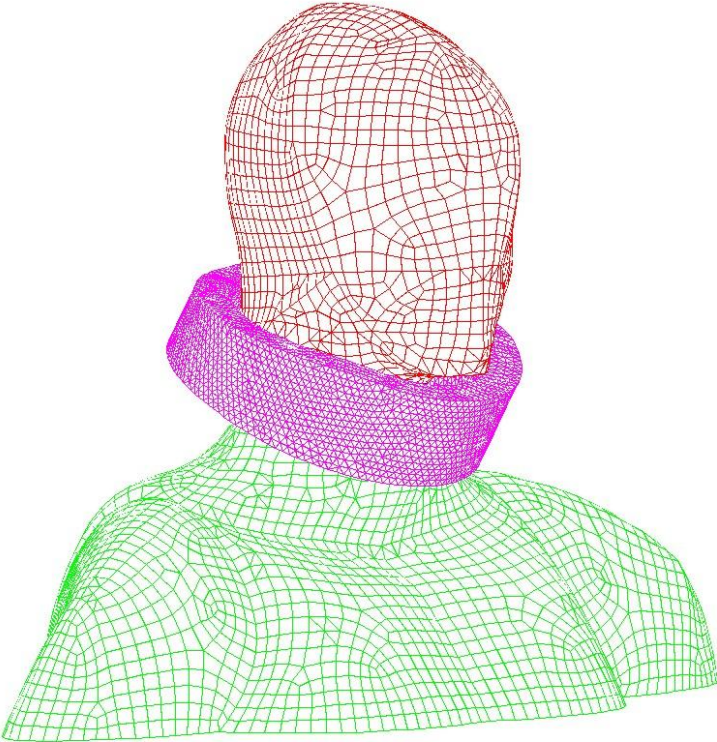


# Neck Weakness





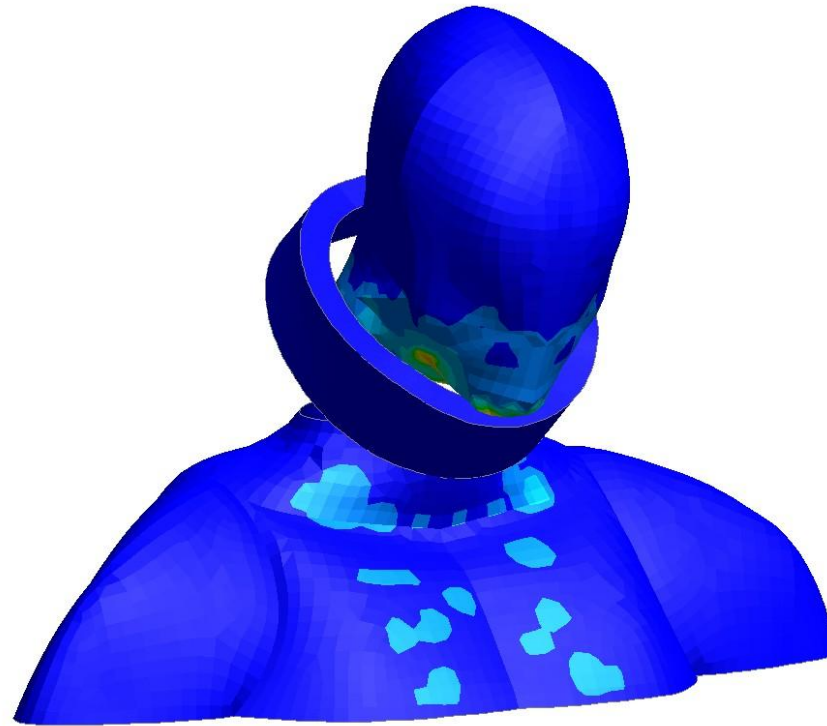
D3PLOT: M1 + M2



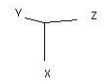


# FEA

D3PLOT: M1 + M2



VON\_MISES\_STRESS  
(Top intg pt)

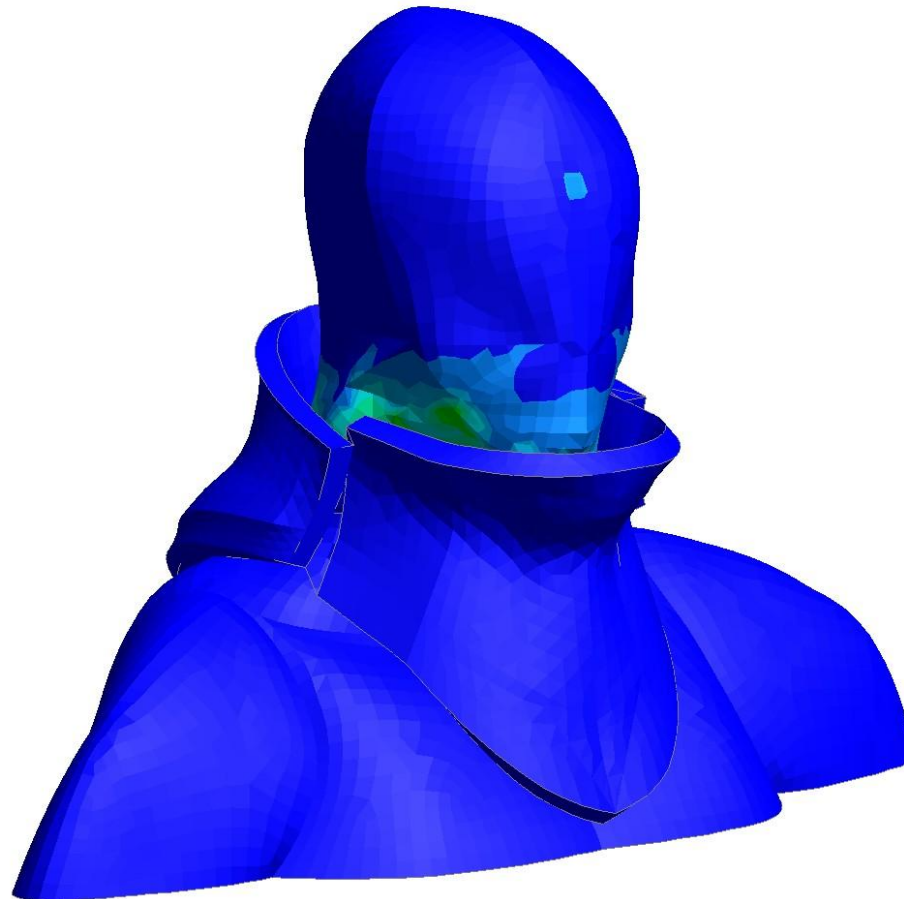


0.042300

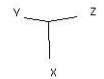


FEA

D3PLOT: M1 + M2



VON\_MISES\_STRESS  
(Top intg pt)



0.026700



- 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





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

- Stephen Hawking



## Contact Details



**Thank you**

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