



Stress comparison between Virtual Reality and usual FSTD

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CESDA: University of Pilots**



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Youngers enjoy being a pilot as a game



Source: gpointstudio in www.freepik.es



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Teenagers enjoy being a pilot as a game



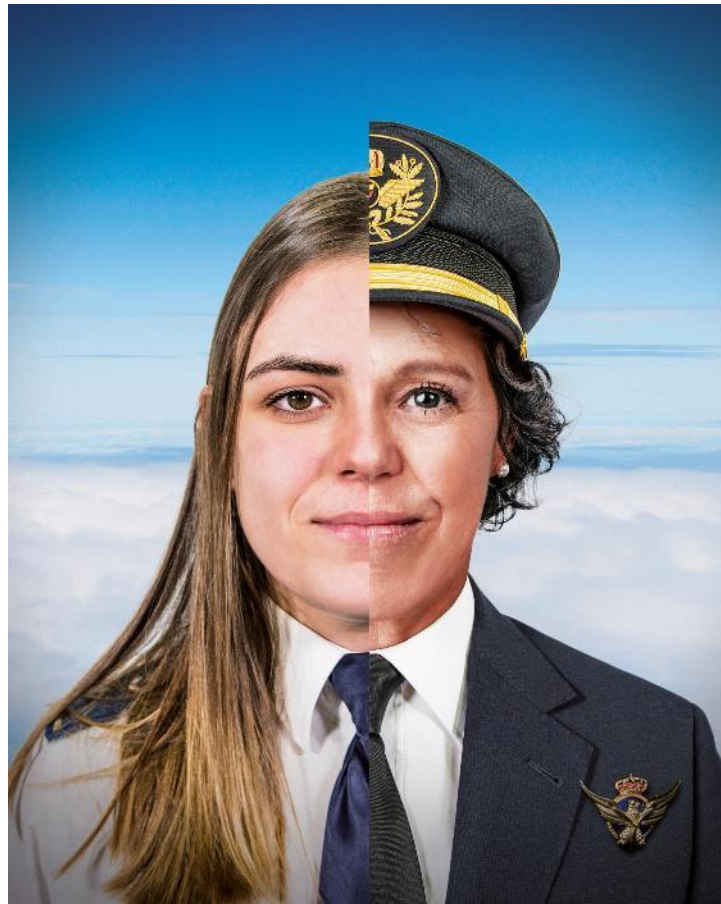
Source: Microsoft Flight Simulator



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Teenagers realize that they want to be pilots



Source: selfmade



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Is Virtual Reality a game? Is Virtual Reality an efficient training device?



Source: selfmade



- VR seems efficient: from Jean Piaget “Learn by doing” (1950s) to recent studies (S. Kavanagh *et. al.*, 2017)
- **What about VR in aviation?**



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Objective: Is VR more efficient stressful than a usual FSTD?



Source: selfmade





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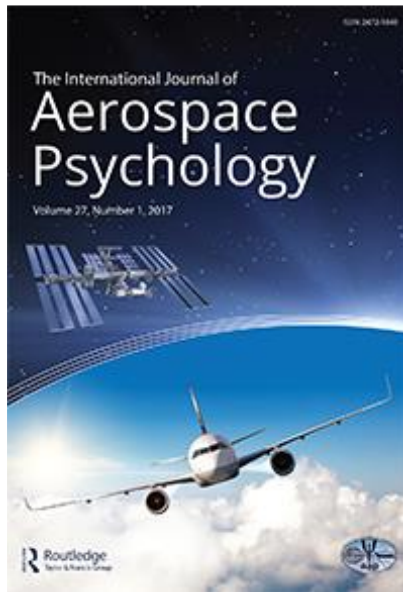
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Short-term stress can affect performance positively

Effects of Stress on Performance during Highly Demanding Tasks in Student Pilots

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- When facing a difficult task, student pilots:
 - Experienced stress → Good performance
 - Lack of engagement → Bad performance



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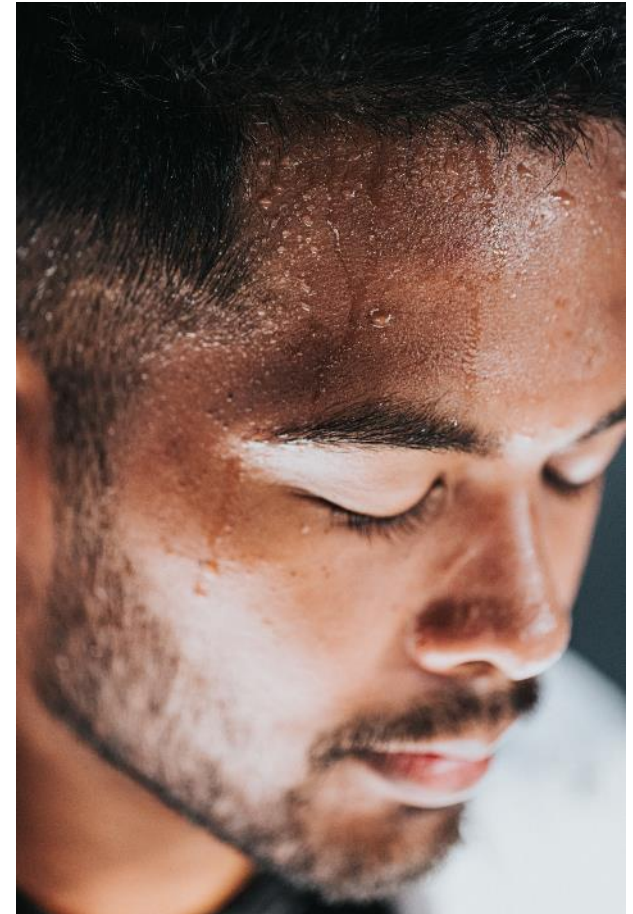
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We can measure stress with a wristband

- Short-term stress activates our sympathetic nervous system
- ElectroDermal Activity (EDA) is related with the electrical conductance of our skin



Empatica E4 wristband



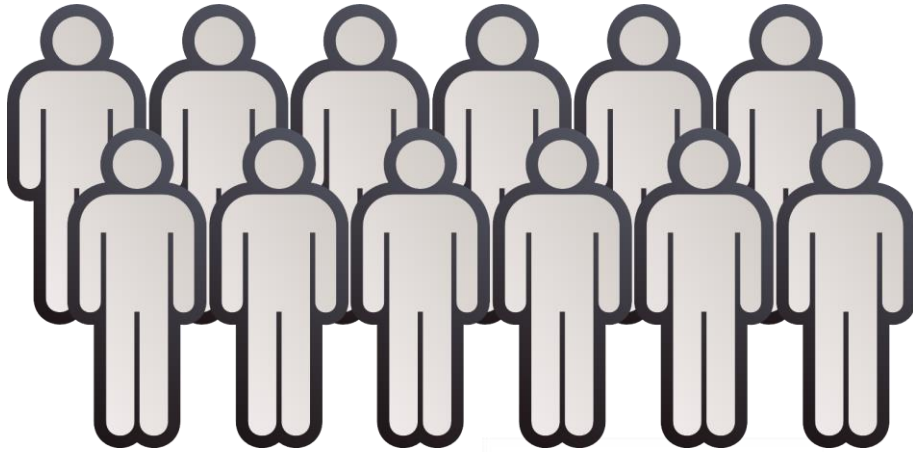
Source: Nathan Dumlao on Unsplash



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What does the experiment consist of?



Source: Álvaro Cabrera in www.freepik.es



Empatica E4
wristband



Thrustmaster Joystick



Oculus Quest 2



Logitech Flight
Rudder pedals



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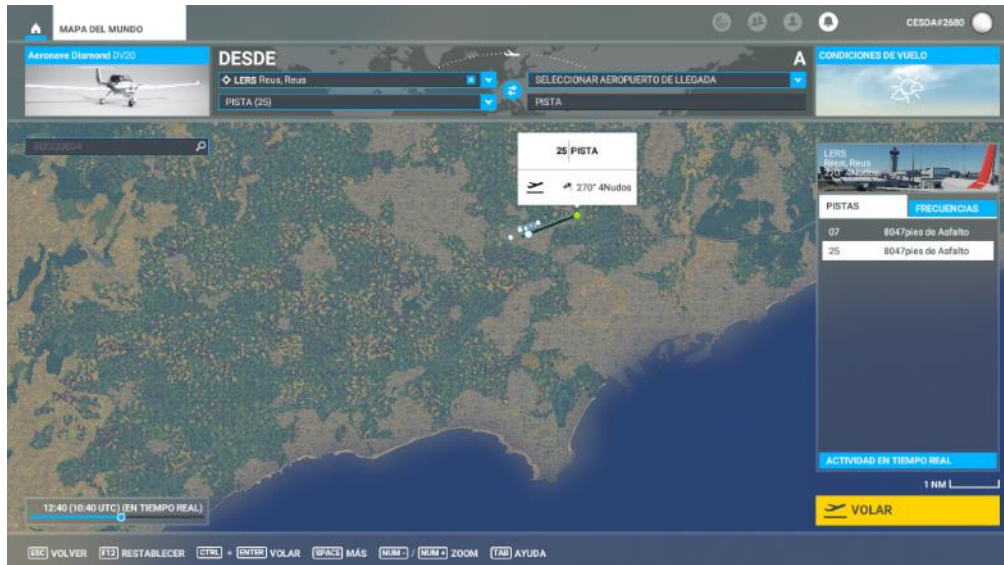
Experiments were held...

- FS2020
- LERS airport (in Spain, 100km from BCN)
- DV20

Aeronave Diamond DV20



Source:
Microsoft Flight Simulator

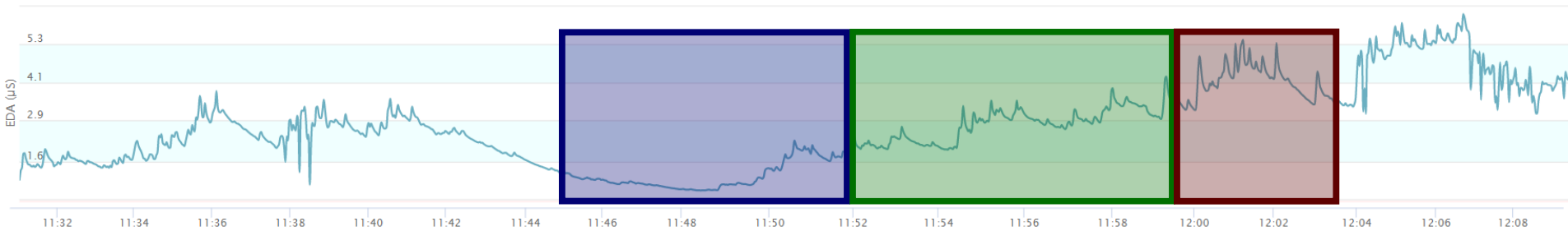




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Stress (EDA) measurements split by task



Maintain 2,500ft and 100kt



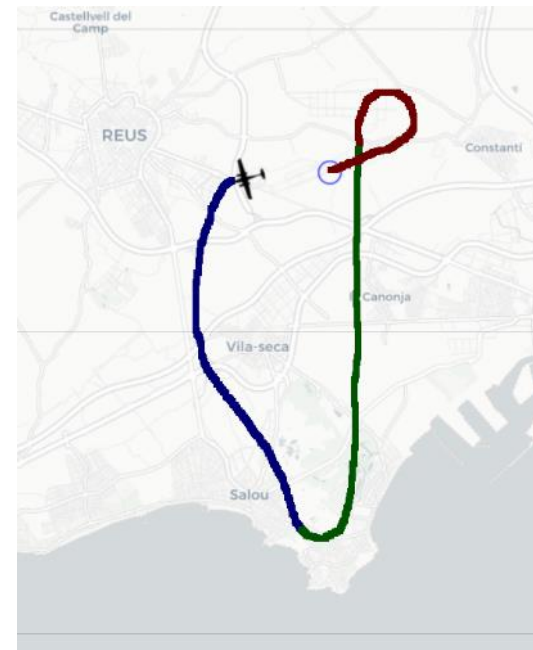
To Cap Salou



To November



Engine Failure



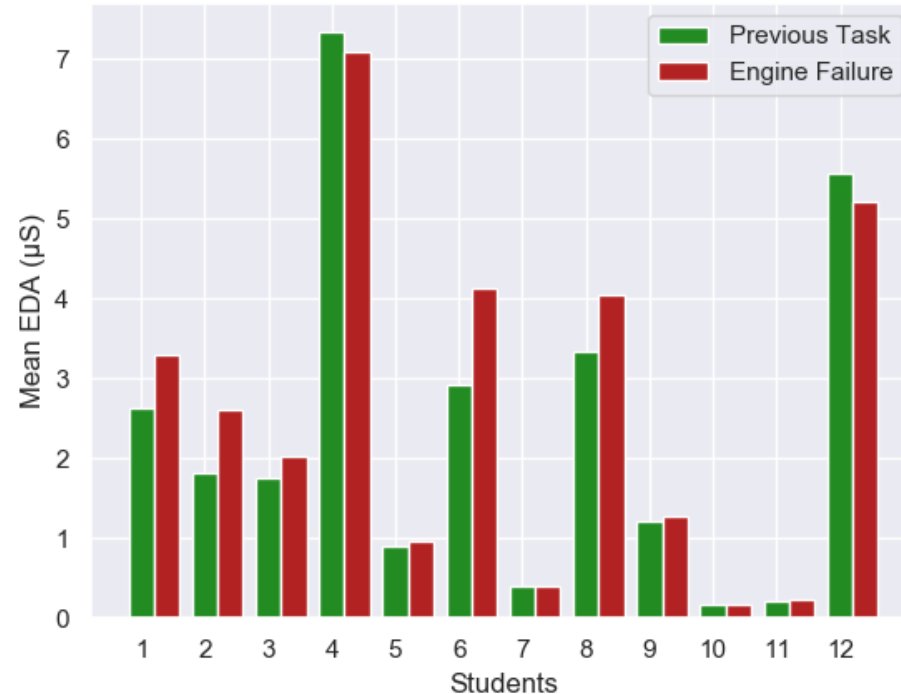


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Students in a Virtual Reality simulator experienced high stress in an emergency

- 9 out of 12 were statistically greater (Mann-Whitney U test)



Source: generated with python 3.7

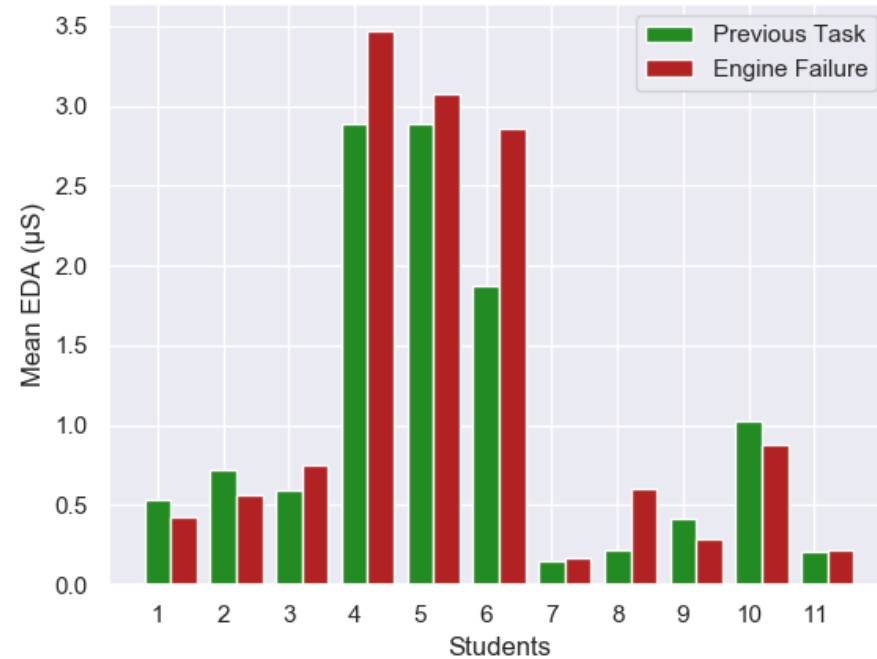


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Students in a usual FSTD simulator also experienced high stress in an emergency

- 7 out of 11 were statistically greater (Mann-Whitney U test)



Source: generated with python 3.7

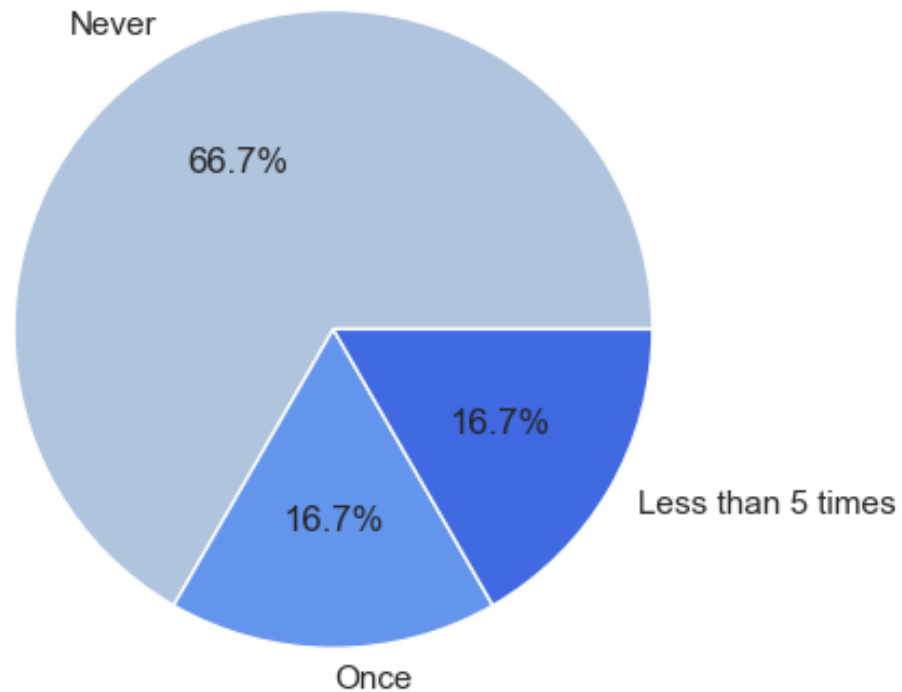




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Have you ever used VR before?



Source: generated with python 3.7



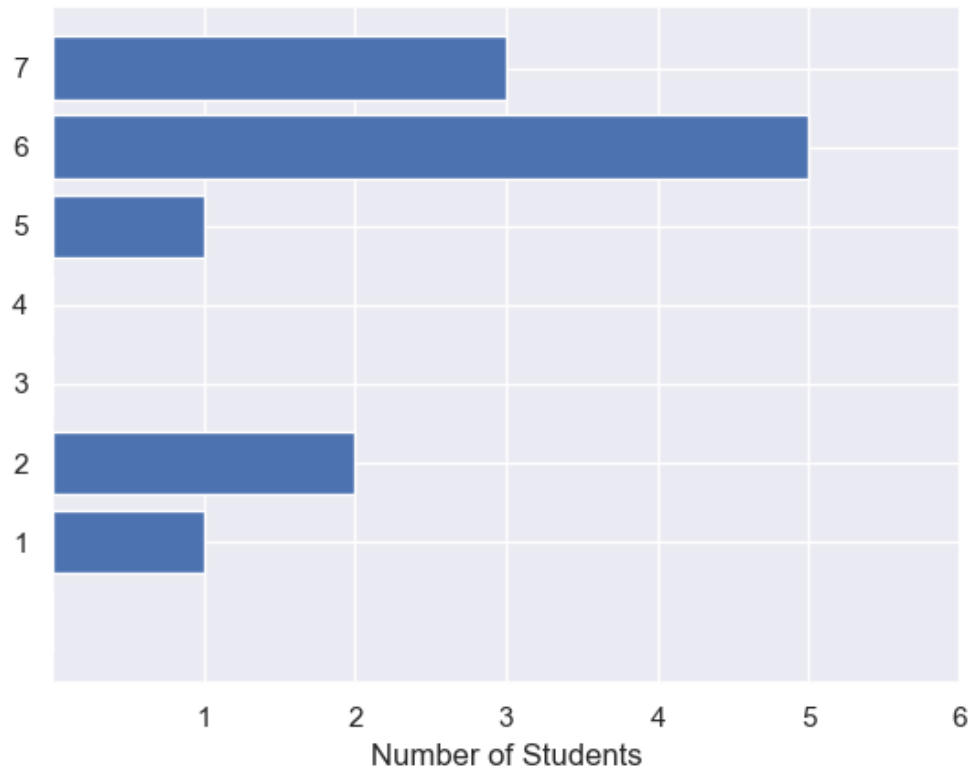
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The experience in VR was more immersive than a usual FSTD?

Strongly agree

Strongly disagree



Source: generated with python 3.7



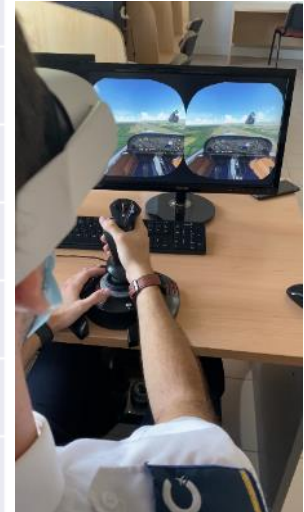
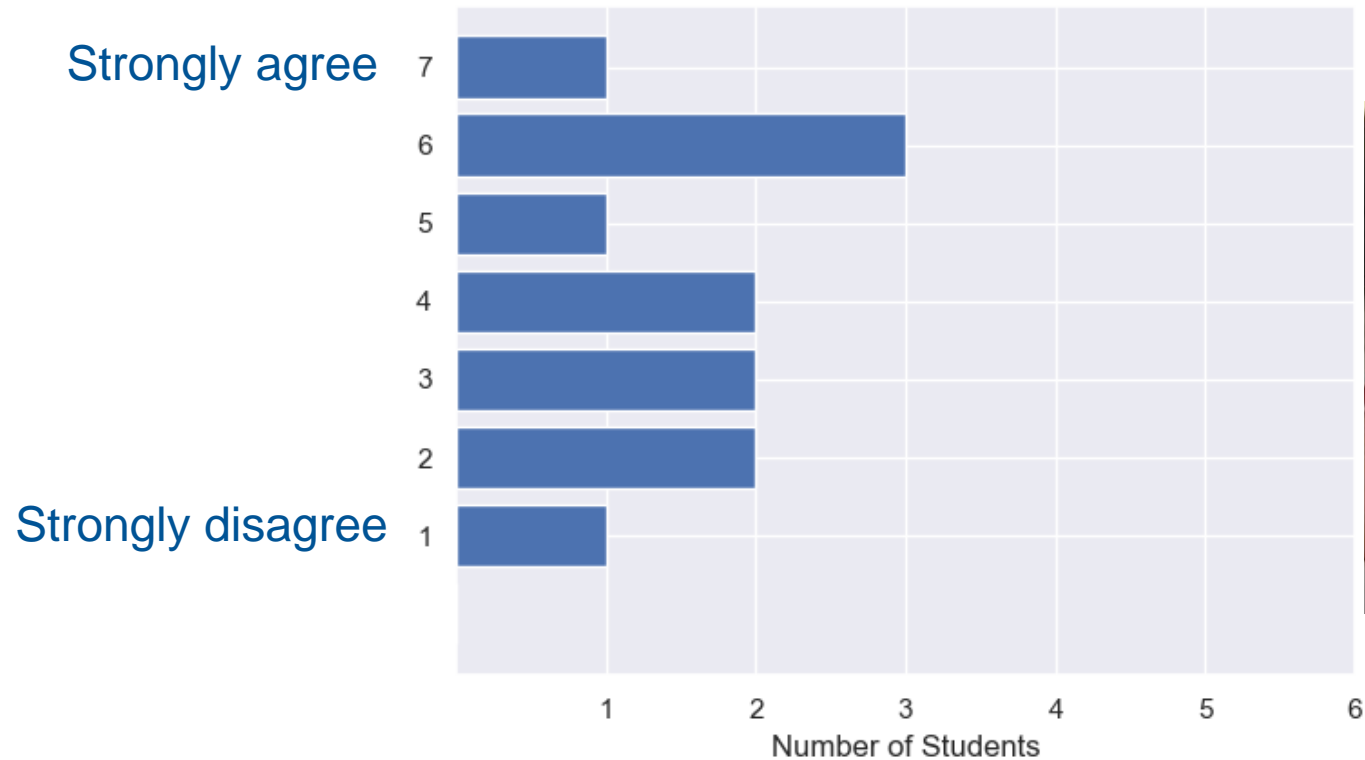
Oculus Touch Controllers



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The experience in VR was more stressful than in a usual FSTD?



Source: generated with python 3.7



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Preliminar Conclusions	Future Work
Students experience short-term stress when performing an emergency in Virtual Reality	More data required. Could affect to pilots safety?
We observe a trend of greater stress in Virtual Reality compared to usual FSTD	More data required. What about performance?
Students consider Virtual Reality more immersive than usual FSTD	Virtual Reality for non-instrumental training?



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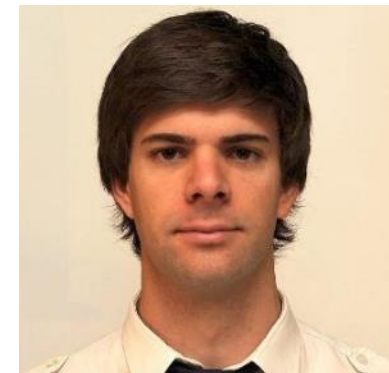


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Thanks for your attention!



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