

Do Operating Tables have a Gender Bias when Performance and Comfort of the Surgeon are Assessed? Imperial College Healthcare NHS Trust A Prospective Laparoscopic Simulation Study.

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Objectives

- Laparoscopy is widely used urogynaecological procedures.
- The operating height in laparoscopy is higher due to:
 - Added length of laparoscopic instruments;
 - Induced pneumoperitoneum of patient (adds ~40cm)¹;
 - Trendelenburg positioning (adds ~5cm).
- The height range of laparoscopic operating tables may pose a height barrier to female surgeons of shorter stature².
- Hypothesis:** commonly available operating tables across National Health Service (NHS) England are higher than optimal for female surgeons performing laparoscopy.

Methods

- Prospective laparoscopic simulation study** in a London university hospital, 2022.
- Gynaecology students, trainees and consultants were recruited; 20 participants were needed for adequate power¹⁻⁵.
- A basic laparoscopic simulation task was performed at 4 operating heights (**Figure 1**) set to 50%, 70%, 90% and 110% of participants' floor to elbow height measurement (cm).
- Outcomes:** task completion time, number of errors (assessed by 2 independent researchers) and surgeon comfort (via Visual Analog Score).

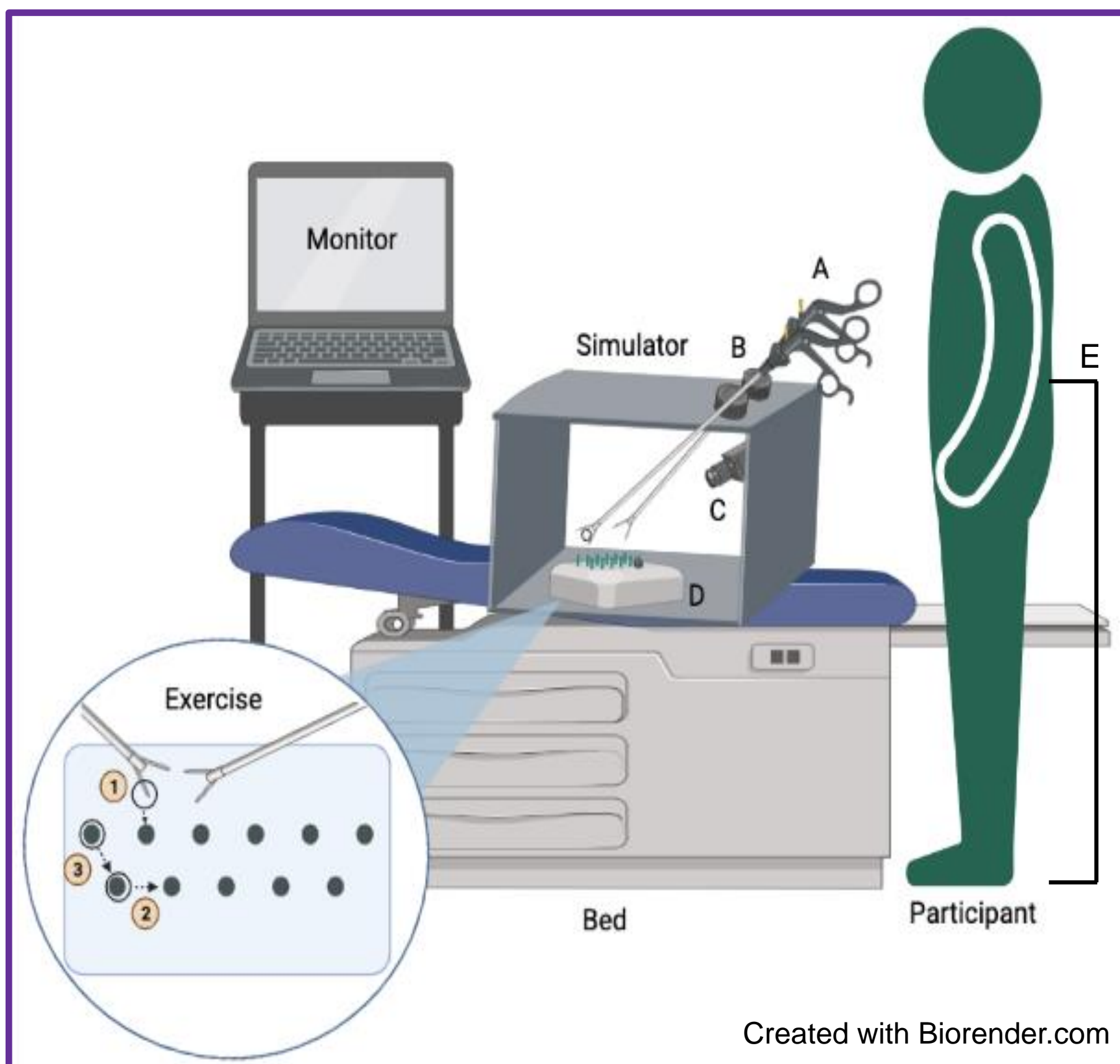
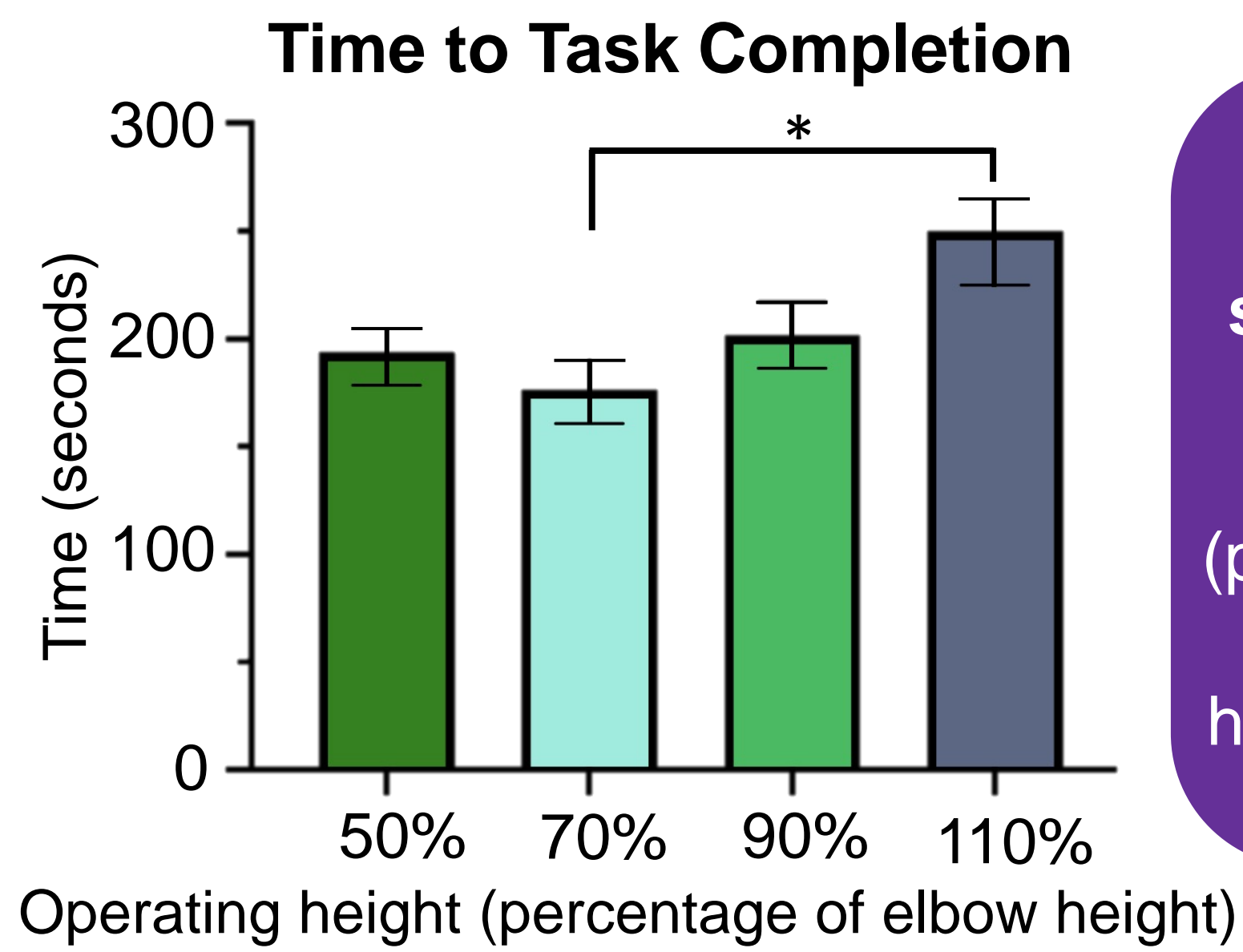


Figure 1: Laparoscopic Simulation Setup
A: 2 laparoscopic graspers: 1 Maryland & 1 Johan Grasper.
B: Operating heights: 2 laparoscopic ports representing level of patient's umbilicus.
C: Laparoscopic camera in fixed position, live video shows on monitor.
D: Ring transfer exercise, representing level of patient's pelvis.
E: Participant's elbow height.

- A literature search of NHS table models was performed to identify minimum heights of available operating tables.
- Statistical analysis: GraphPad Prism 9.0 and SPSS 28.0.
- No ethical approval was required as no processing of identifiable or confidential information occurred.

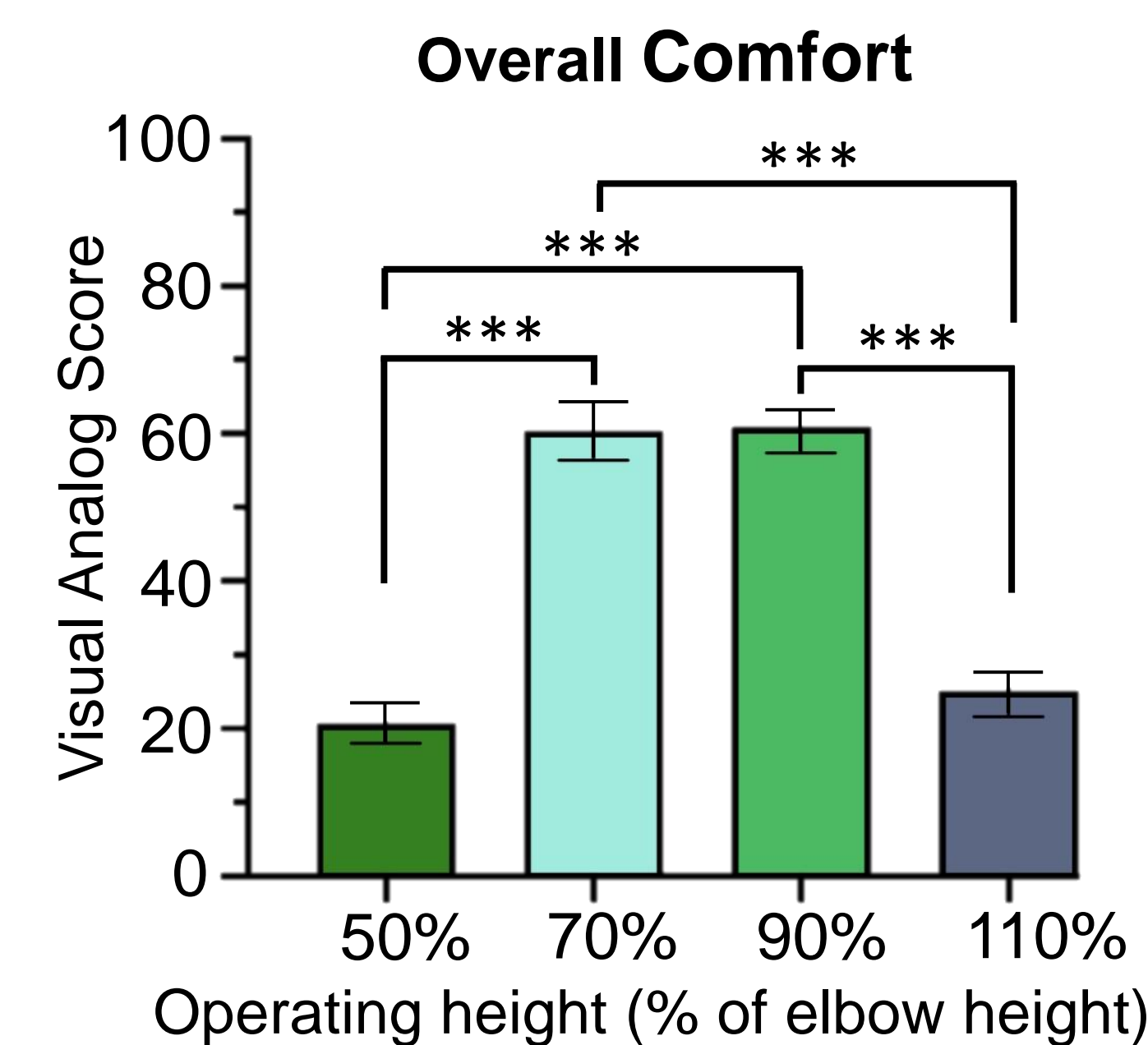
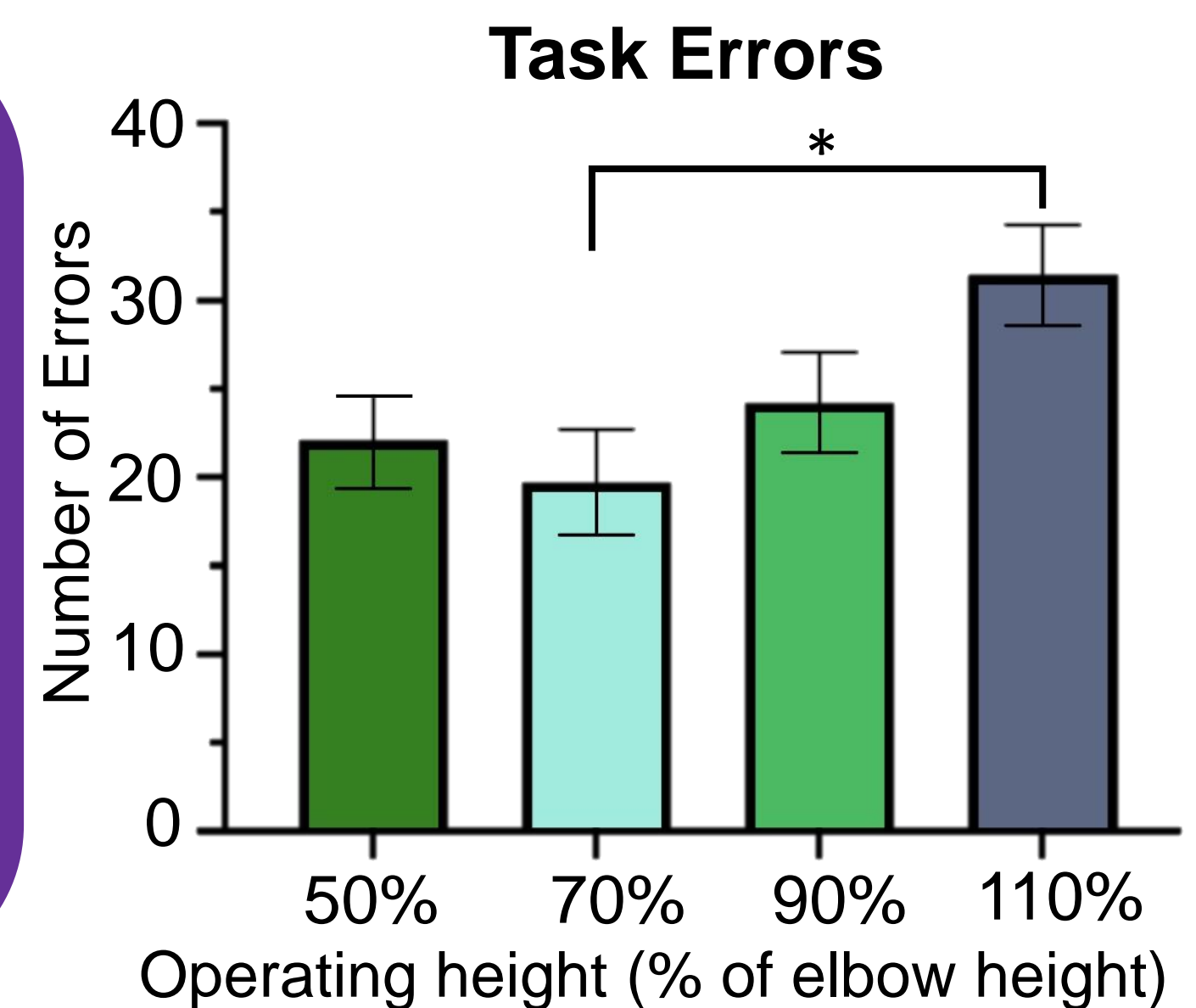
Results

- There were **30 participants**: 16 females, 14 males.
- Outcomes did not differ between male and females.
- Mean elbow height was 116.6cm ±3.73 for males and 104.6cm ±4.86 for females (p<0.001).



- Simulation when operating at **70% of surgeon elbow height** yielded fastest task completion time (p=0.026, 95% CI 6.212s to 140.9s) than the highest operating height, 110%.

- Surgeons made fewer errors at 70% of operating height, compared to the highest height (p=0.023, 95% CI 1.185 to 22.21 errors)
- There were increased errors precision and bimanual dexterity errors at the highest height (p<0.05)



- Reported comfort was highest when operating at 70% and 90% of elbow height.
- Simulation at 110% of elbow height was associated with increased shoulder discomfort (p<0.05).

- NHS Supply Chain models⁶: median minimum table height with standard mattress was 69.75cm (66-75cm).
- NHS Buyer's Guide Advice⁷: minimum table height with mattress should be 72.5cm or lower.

Conclusions

Performance (Time & Errors) Optimisation Operating at 70% of surgeon elbow height, under simulation

Surgeon Comfort Optimisation Operating at 70-90% of surgeon elbow height, under simulation

- Surgeon sex did not impact upon performance nor comfort, suggesting no innate differences in ability.
- Data on commonly available operating tables across NHS England was limited; although buying standards were identified.
- Operating on the average size patient at 90% of elbow height, we estimate operating tables of NHS buying standards are too high for more than half of the male population and all of the female population.
- To accommodate surgeons of shorter stature, minimum operating table height should lower to approximately 28cm high.
- Concluding Message:** New laparoscopic operating with a lower minimum height of approximately 28cm high are necessary to optimise surgeon performance and comfort without bias against the female sex and surgeons of shorter stature.

The Authors Declare No Conflict of Interest.

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