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RESEARCH

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Orthopaedic surgeons: as strong as an ox and almost twice as clever? Multicentre prospective comparative study

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Abstract

Objective To compare the intelligence and grip strength of orthopaedic surgeons and anaesthetists.

Design Multicentre prospective comparative study.

Setting Three UK district general hospitals in 2011.

Participants 36 male orthopaedic surgeons and 40 male anaesthetists at consultant or specialist registrar grade.

Main outcome measures Intelligence test score and dominant hand grip strength.

Results Orthopaedic surgeons had a statistically significantly greater mean grip strength (47.25 (SD 6.95) kg) than anaesthetists (43.83 (7.57) kg). The mean intelligence test score of orthopaedic surgeons was also statistically significantly greater at 105.19 (10.85) compared with 98.38 (14.45) for anaesthetists.

Conclusions Male orthopaedic surgeons have greater intelligence and grip strength than their male anaesthetic colleagues, who should find new ways to make fun of their orthopaedic friends.

Introduction

A humorous anaesthetic colleague recently repeated the following popular saying while an operating table was being repaired with a mallet: "typical orthopaedic surgeon—as strong as an ox but half as bright." Making fun of orthopaedic surgeons is a popular pastime in operating theatres throughout the country. This pursuit has recently spread to the internet; a humorous animation entitled "orthopedia vs anesthesia" had received more than half a million hits at the time of writing.[1] Several comparisons of orthopaedic surgeons to primates have been published, and the medical literature contains suggestions that orthopaedic surgery requires brute force and ignorance.[2-4]

The stereotypical image of the strong but stupid orthopaedic surgeon has not been subject to scientific scrutiny. Previous studies have shown that the average hand size of orthopaedic surgeons is larger than that of general surgeons.[2 3] However, a search of the worldwide scientific literature found no studies assessing the strength or intelligence of orthopaedic surgeons. In the absence of a cohort of willing oxen as a control group, and given that the phrase is popular with anaesthetists, we designed this study to compare the mean grip strength of the dominant hand and the intelligence test score of orthopaedic surgeons and anaesthetists.⇓

Methods

We compared the strength and intelligence of orthopaedic surgeons and anaesthetists in three district general hospitals during a two week period in 2011. We included consultant and registrar grades, as these grades indicate commitment to the chosen specialty. We invited all doctors who were present in the hospital during any day of the two week period to participate. We excluded doctors on leave for the whole period and those who chose not to take part. Because of a lack of female orthopaedic surgeons in all three hospitals, we restricted the study to men.

We measured intelligence by using a surrogate for the widely accepted intelligence quotient (IQ). By definition, the median IQ of the general population is 100 and the standard deviation is 15. We used the Mensa Brain Test version 1.1.0 (Barnstorm

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Entertainment Group) to measure intelligence. This is a standardised test that uses questions taken from official Mensa IQ tests and is endorsed by Mensa (a worldwide organisation for people with an IQ in the top 2%). The test consisted of 20 multiple choice questions with a 20 minute time limit and negative marking for incorrect answers. Participants used a hand held touch screen computer (iPhone 4) to complete the test. Five trial questions allowed participants to become familiar with the question format and test apparatus. Help was available as needed, so that difficulty understanding the test apparatus did not influence participants' results. Participants completed the test in a distraction-free environment. The test yielded scores in a similar format to a formal IQ test, designed to have a median value of 100 and a standard deviation of 15.

We measured strength by using the surrogate of grip strength of the dominant hand. We chose this on grounds of acceptance for participants, portability, and validity. We used a calibrated Jamar hydraulic hand dynamometer (Sammons Preston Rolyan, Chicago, IL, USA). Participants sat in a straight backed chair with the shoulder adducted and neutrally rotated, elbows flexed at 90°, the forearm in a neutral position, and the wrist at 0° extension with 0° of ulnar deviation. We recorded the best of three attempts from the dominant hand.

We collected data in an Excel spreadsheet (version 12.2.9) and analysed them with Stata/SE 10.0 for Unix. We examined strength and IQ for normality by testing for skewness and kurtosis. Variables that deviated significantly from a normal distribution were subject to a transformation before further analysis. We formally tested the association between specialty and IQ and between specialty and grip strength by using linear regression models with robust sandwich estimation of the variance (allowing for clustering by hospital). These models incorporated multiple predictors (including specialty, age, handedness, and grade). We then used Wald tests to assess the significance of individual parameters of the model.

We based sample size calculations on a type I error of 0.05, a type II error of 0.2, a mean of 100 and a standard deviation of 15. For an effect size of a 10 point difference in IQ, we needed 36 participants in each group.

Results

Thirty six male orthopaedic surgeons were available to take part. Forty male and six female anaesthetists took part. Sex is a significant confounding factor of grip strength.[5] The paucity of female orthopaedic surgeons meant that we could make no meaningful comparison of women, so we excluded these data from analysis, leaving 36 in the orthopaedic group and 40 in the anaesthetist group. Table 1⇓ shows the demographics and measured parameters of each group. Figure 1⇓ shows the results of measured parameters graphically in the form of a scatter plot.

Intelligence did not deviate significantly from a normal distribution (P=0.1444). Strength, however, did deviate (P=0.0094), and this deviation seemed to be largely driven through skew (P=0.007) as opposed to kurtosis (P=0.062). We therefore log transformed grip strength data before regression analysis.

We examined the association between specialty and IQ and between specialty and grip strength by using linear regression models with robust sandwich estimation of the variance (allowing for clustering by hospital). These models incorporated various putative predictors available at the time of analysis (specialty, age, handedness, and grade). Specialty showed a significant relation with both intelligence (F=18.95, df=1,2; P=0.0489) and log(grip strength) (F=35.02, df=1,2; P=0.0274) (table 2⇓). Specifically, orthopaedic surgeons had a higher mean intelligence score (105.19 *v* 98.38) (fig 2⇓) and a higher mean grip strength (47.25 *v* 43.83 kg) (fig 3⇓).

Discussion

This study is the first of its kind to provide evidence for the perpetual banter between orthopaedic surgeons and anaesthetists. We have shown a small but statistically significant difference in both grip strength and intelligence score between the two groups, with higher results for orthopaedic surgeons.

The intelligence scores were lower than anticipated for IQ in the medical profession. This is likely to be a reflection of the way in which intelligence was tested, and the scores derived from the rather difficult Mensa brain test may not be directly comparable to IQ scores. We selected the abbreviated Mensa test carried out by touch screen for speed and convenience. Full formal IQ testing is more time consuming and cumbersome and would have affected doctors' willingness to participate in this study.

The difference in intelligence scores between groups was unexpected. We had predicted that the anaesthetist group might outperform the orthopaedic group, as intellectually challenging activities such as crosswords and Sudoku are popular among anaesthetists. Neither activity has been found to be linked to IQ, however, and the IQ test probably assesses more complex facets of intelligence than those exercised by popular puzzles.[6]

Human muscle strength can be measured in many ways, and the appropriateness of testing particular muscles is debatable. Dominant hand grip strength is just one facet of overall human strength, but it is well validated, reproducible, easy, and convenient to measure.[7] Orthopaedic surgery can be a physical occupation requiring a strong grip on hand operated instruments, so high grip strength is perhaps not surprising. However, many facets of anaesthesia also require a strong grip, such as manipulating a laryngoscope or maintaining a seal with a facemask. If we had assessed other medical specialties, the difference may have been more pronounced.

Limitations

This work has several limitations. The male preponderance in orthopaedic surgery meant that we were unable to recruit any female orthopaedic surgeons in the three hospitals included in this study, so our findings apply only to men. In the most recent manpower censuses, 94.8% of orthopaedic consultants in the United Kingdom were male compared with 71.2% of anaesthetists, so our sample is relevant to most of the population.[8,9]

We chose the measures for both strength and intelligence testing as a compromise between validity, cost, and convenience. A full formal IQ test lasting up to two hours per assessment and whole body isokinetic strength testing machines were outside the scope of this study. The three district general hospitals chosen for the study may not be representative of the whole population, and repetition including more centres with a mix of teaching, district general, and private hospitals would be desirable.

Our selection criteria could have introduced bias, as doctors who were on leave for the whole two week period were not sampled and nor were those who declined to participate. People who had insight into their weaknesses may have been under-represented, thereby increasing the mean score in that group. Interestingly, no orthopaedic surgeons and two anaesthetists declined to participate.

Conclusion

The stereotypical image of male orthopaedic surgeons as strong but stupid is unjustified in comparison with their male anaesthetist counterparts. The comedic repertoire of the average anaesthetist needs to be revised in the light of these data. However, we would recommend caution in making fun of orthopaedic surgeons, as unwary anaesthetists may find themselves on the receiving end of a sharp and quick witted retort from their intellectually sharper friends or may be greeted with a crushing handshake at their next encounter.

Contributors: PS participated in data collection and interpretation and wrote the paper. SK and VS participated in data collection and interpretation and helped to write the paper. SAGW-O helped with data analysis and interpretation and helped to write the paper. CAW-O participated in data interpretation and helped to write the paper. CAW-O and PS developed the idea for the study and are the guarantors.

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Ethical approval: Not needed.

Data sharing: No additional data available.

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What is already known on this topic

A stereotypical impression of orthopaedic surgeons exists, in which they are perceived to have a lower intelligence and greater strength than average for the medical profession

This is often the subject of light hearted humour, particularly in jokes with anaesthetists

What this study adds

Male orthopaedic surgeons had a higher mean intelligence and grip strength compared with male anaesthetists

Revision of the typical comedic repertoire regarding orthopaedic surgeons is recommended

Tables

Table 1| **Participants' demographics, intelligence, and grip strength**

Characteristic	Orthopaedic surgeons (n=36)	Anaesthetists (n=40)
Mean (SD) age (years)	42.2 (8.82)	42.5 (8.63)
Grade—consultant:specialist registrar	20:16	21:19
Handedness—right:left	36:0	38:2
Mean (SD) intelligence	105.19 (10.85)	98.38 (14.45)
Mean (SD) grip strength (kg)	47.25 (6.95)	43.83 (7.57)

Data are shown before transformation for ease of interpretation.

Table 2| Statistical relation between speciality and both strength and intelligence, as tested by linear regression

Attribute	F statistic	Test constraints df	Residual df	P value
Intelligence	18.95	1	2	0.0489
Grip strength (log transformed)	35.02	1	2	0.0274

Figures

[Image: Clive Featherstone]

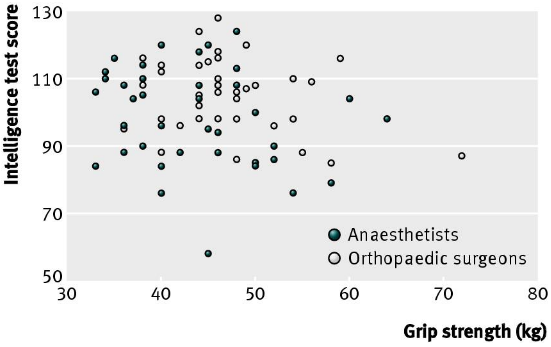

Fig 1 Scatter plot of grip strength against intelligence score, by specialty

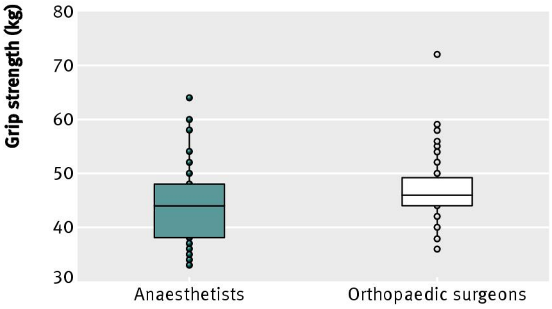

Fig 2 Box plot of grip strength (kg) by specialty (data shown before transformation for ease of interpretation). Upper and lower whiskers represent 1.5 times and −1.5 times interquartile range; upper and lower hinges represent 25% and 75% quartiles; middle represents median or 50% quartile

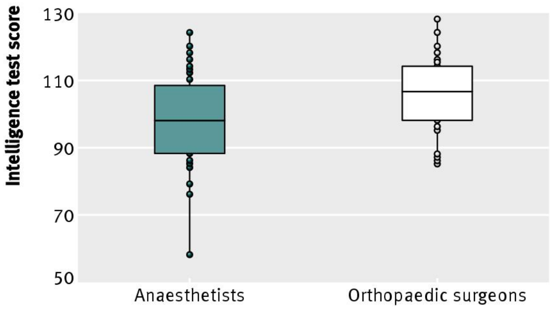

Fig 3 Box plot of intelligence test score by specialty. Upper and lower whiskers represent 1.5 times and −1.5 times interquartile range; upper and lower hinges represent 25% and 75% quartiles; middle represents median or 50% quartile