

## Rounded data have a high potential for false comparative statistical results as shown with elbow arc of motion

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### BACKGROUND AND HYPOTHESIS

Visually measured range-of-motion (ROM) data are usually rounded to the nearest 5° interval and then recorded. Rounding might significantly influence the outcome of statistical tests.

### METHODS

We performed numerical simulation of t test application on 2 datasets, as typically reported for the elbow flexion-extension arc of motion. The test was performed on exact data and then repeated on the same data rounded to the nearest 5° interval. The simulation input parameters were as follows: difference in means (1°-30°), standard deviation (1°-30°), and number of cases (15, 30, 60, and 120). Diverging results were counted to find the rate of failure.

### RESULTS

Depending on the given difference in means, the given standard deviation, and the number of cases, the failure rate of the t test after rounding reached up to 40%.

### DISCUSSION AND CONCLUSION

The accuracy of statistical tests performed on rounded ROM data is limited because of loss of information after rounding to the nearest 5° interval. This affects parametric and nonparametric tests, as well as paired and unpaired tests. In the future, authors should specify how ROM has been measured and recorded, explicitly addressing rounding. Furthermore, to test a zero hypothesis on rounded ROM data, authors should apply our P value ( $\alpha$ ) correction.

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