How to calculate magnitude based inferences

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Statistics | Technical note | MBI | Video

Headline

This video aims to show viewers how to calculate magnitude-based inferences (MBI) and is based on the work of Professors William Hopkins and Alan Batterham.(1) MBI analysis represents a break from the more traditional statistical approach of identifying significant differences by way of p values, with its main criticism centring on an arbitrary value (i.e., 0.05) which denotes a difference on one side, and none on the other. In sport for example, what would you do if you had just implemented a new training system, analysed your results, only to find it made no difference – you obtained a p value of 0.06! While this might be at odds with what you see and feel, you must be objective and thus conclude that there is no statistical difference. But should you really tear it up and head back to the drawing board? As the coach or sport scientist that decision is for you to make, but is 0.06 really so different from 0.05? And are these not the same fractions that determine the winners from the losers at just about every Olympic and Paralympic event? Next, consider a study where you are pitching two new training systems against your current one – should you change to using one of them and if so, which one should you use? Well another short fall of just using the p value, is that while it may tell you that both are different, you don't know by how much. You just know they are different, that's it.

MBI analysis tries to address these shortcomings. Firstly, it surrounds the test score you have just achieved with confidence intervals to denote the range of scores you may have got had you tested the whole population you were interested in. It then weights (as a percentage) how far this range is to the left or right of the control group's range. Crudely, the more to the right, the greater the increase in scores compared to the control group. The more to the left, the greater the decrease in scores compared to the control group. As the gap between the control group and the intervention group grows, so can your confidence and certainty that a change exists. As such, changes are not binary classifications of YES or NO, but classed as "trivial", "possibly", "likely" and "very likely". Then finally, thresholds to denote what would be classed "small", "moderate", and "large" changes are factored in, to help you classify the likelihood of change, with respect to magnitude. So now you get to decide between one training system showing a "likely small" change vs. another demonstrating a "very likely large" change. This additional information should help in the decision-making process.

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References

1. Batterham AJ, Hopkins WG. Making meaningful inferences about magnitudes. Int J Sports Physiol Perform. 2006;1(1):50-7