SPORTSCIENCE sportsci.org

News & Comment: In Brief

Reviewers: Alan M Batterham, Department of Sport and Exercise Science, University of Bath, Bath BA2 7AY, UK; Caroline Burge, School of Medicine, University of Queensland, Brisbane 4006, Australia; Keith Davids, Department of Exercise and Sport Science, Manchester Metropolitan University, Alsager, Cheshire ST7 2HL, UK; John A Hawley, Division of Exercise Sciences, RMIT University, Victoria 3083, Australia.

- Clinical vs Statistical Significance. Likelihoods of clinical or practical benefit and harm are superior to the p value that defines statistical significance. Reviewer's comment
- Qualitative vs Quantitative Research Designs. What's happened here vs what's happening generally. Reviewer's comment
- A Ban on Caffeine? Coffee, tea, Coke, and chocolate are off the athlete's menu in this unrealistic proposal.
- Editorial: Anti-Spamming Strategies. Guard your email address to reduce junk messages.

Reprint pdf · Reprint doc

Clinical vs Statistical Significance

Will G Hopkins, Physiology and Physical Education, University of Otago, Dunedin 9001, New Zealand. Email.
Sportscience 5(3), sportsci.org/jour/0103/inbrief.htm#clinical, 2001 (630 words)

You have spent many months and many thousands of dollars studying an effect. You have analyzed the data in a new manner that takes into account clinical or practical significance. Here is the outcome of the analysis for the average person in the population you studied: an 80% chance the effect is clinically beneficial, a 15% chance that it has only a clinically trivial effect, and a 5% chance that it is clinically harmful. Should you publish the study? I think so. The effect has a good chance of helping people. Indeed, it has 16 times more chance of helping than of harming. If you think that the 80% chance of helping is too low or that the 5% risk of harming is too high (it will depend on the nature of the help and harm), you could get more data before you publish. But if there's no more money or time for the project, publish what you've got. Other researchers can do more work and meta-analyze all the data to increase the disparity between the likelihoods of help and harm.

Will the editor of a journal accept your data for publication? To make that decision, the editor will send your article to one or more so-called peer reviewers, who are usually other researchers active in your area. Most reviewers base their decisions on statistical significance, which they know has something to do with the effect being real. Statistical significance is defined by a probability or p value. The smaller the p value, the less likely the effect is just a fluke. When the p value is less than 0.05, you can call the result statistically significant. Your article is much more likely to be accepted when p=0.04 than when p=0.06.

So what is the p value for the above data? Incredibly, it's 0.20. Check for yourself on the spreadsheet for confidence limits, which I have recently updated to include likelihoods of clinically important and trivial effects for normally distributed outcome statistics. To work out these likelihoods, you need to include the smallest clinically important positive and negative value of the effect you have been studying. In this example I chose ±1.0 units. I made the observed value of the effect 3.0 units–obviously clinically important as an *observed value,* but at issue is the likelihood that the *true value* (the average value in the population) is clinically important. You will also have to include a number for degrees of freedom; I chose 38 (as in, for example, a randomized controlled trial with 20+20 subjects), but the estimates of likelihood are insensitive to all but really small degrees of freedom. Finally, of course, you will need the p value, here 0.20. You can get even more excitingly non-significant findings with smaller p values. For example, changing p to 0.10 makes the likelihoods 87%, 12% and 2% for help, triviality, and harm respectively. Yet even these data would be rejected by most reviewers and editors, because p>0.05.

Something is clearly wrong somewhere. It's not the spreadsheet; it's the requirement for p<0.05. Statistical significance does not do justice to some clinically useful effects. We should be reporting probabilities of clinical significance, not the probability that defines statistical significance. Reviewers and editors would then make better decisions. We still need to report precision of estimation using likely (confidence) limits for the true value of the effect, but 95% limits give an impression of too much uncertainty for some clinically useful effects. Even 90% might be too conservative in this respect, but there is something appealing about limits that define the true value correctly 9 times out of 10.

Reviewer's comment

Qualitative vs Quantitative Research Designs

Will G Hopkins, Physiology and Physical Education, University of Otago, Dunedin 9001, New Zealand. Email.
Sportscience 5(3), sportsci.org/jour/0103/inbrief.htm#qual, 2001 (418 words)

This year I gave a series of talks in several places on exercise and sport research. I used simple PowerPoint slides to act as a stimulus for informal discussion. Most of the material is already at this site in one form or another, but I sometimes added new stuff that might be useful for people giving or taking courses in our discipline. To download the slides for the talk I gave on research design, click on this link. Other talks will follow in future issues of Sportscience.

Most of these slides represent a summary of an article on quantitative research published here last year, but I have now included an overview of qualitative research. My neo-positivistic perspective will outrage radical post-modernists, but it's probably a fair representation of the world that the moderates inhabit.

I used to be critical of my story-teller colleagues, until I realized that qualitative research in its purest form is the science of single case studies, rather like the quest for truth in a court case. You should employ a qualitative researcher anytime you want an answer to a question of the form *what's happened here.* For example: why is our team under-performing, why can't we swim as good as the Australians, how should we reorganize our sports institute, and what can we learn from attitudes to sport in the 1930s? Qualitative researchers also engage in *action research:* an intervention to change the world at the single-case level. A suitably qualified qualitative researcher might be able to make your team perform better.

On the other hand, a quantitative researcher has the skills to find out *what's happening generally.* For example, what's the effect of strength training on rowing economy, what predicts individual responses to the effect of exercise on blood lipids, what are the main causes of acute and chronic injuries in triathletes, and why do kids choose to play particular sports? Quantitative researchers indulge in observational (descriptive) studies to quantify associations between variables, but they sort out cause and effect with experimental studies (interventions).

Qualitative researchers usually gather data by observing and interviewing, whereas quantitative researchers usually test and measure. But I don't think these methodologies should define the two paradigms. What matters is the scope of your inferences: a conclusion about a single case is qualitative research; a generalization from two or more cases is quantitative.

Reviewer's comment

A Ban on Caffeine?

Will G Hopkins, Physiology and Physical Education, University of Otago, Dunedin 9001, New Zealand. Email.
Sportscience 5(3), sportsci.org/jour/0103/inbrief.htm#caffeine, 2001 (372 words)

For most endurance athletes, a couple of 100-mg caffeine pills taken an hour or so before a race will increase power output by a few percent. The International Olympic Committee therefore lists caffeine as a banned substance, but the caffeine in such everyday foods as coffee, tea, chocolate, and Coca-Cola has made enforcement of the ban impractical. The IOC has therefore somewhat ambiguously made caffeine also a restricted substance by setting an upper limit on the amount athletes can have in a urine sample. A 70-kg athlete would probably exceed the limit by drinking more than 5 cups of strong coffee or 5 liters of Coke.

Now there's been a call to enforce the absolute ban (Graham, 2001). The reason? Caffeine use is unethical, because caffeine is not a "traditional nutrient", and because some athletes take caffeine "for the express purpose of gaining an advantage". The sentiment is well-intentioned, but the reasoning is illogical. Traditional foods contain caffeine, so caffeine is a traditional nutrient. Athletes train hard, eat well, and buy expensive equipment to gain an advantage, but we aren't about to ban those practices. Sure, there's a sense in which caffeine is a drug, and there's a sense in which use of any drug is unethical, even when there is no known health risk. But when the drug is part of normal food, an absolute ban would be more than a great inconvenience: in my view it is unethical to make athletes change customary dietary behaviors for the sake of sport.

It would be appropriate to ban deliberate use of pure caffeine, but it’s unlikely anyone can develop a urine or blood test that would distinguish between the synthetic caffeine in capsules and the natural caffeine in the normal diet. The caffeine in drinks containing extracts of guarana berries would also be a problem. These drinks probably work better than coffee, which contains something that partly counteracts the ergogenic effect of caffeine. Guarana drinks are nevertheless natural, if not traditional, fare that should not be banned.

Graham TE (2001). Caffeine and exercise. Sports Medicine 31, 785-807

Editorial: Anti-Spamming Strategies

Will G Hopkins, Physiology and Physical Education, University of Otago, Dunedin 9001, New Zealand. Email.
Sportscience 5(3), sportsci.org/jour/0103/inbrief.htm#editorial, 2001 (335 words)

Spam is unsolicited junk email inviting you to part with your money in various annoying and often offensive ways. Spammers now get email addresses off Web pages using automated search engines. To offer some interim protection to authors of articles at this site, I have now replaced the "@" sign in all email addresses with something that should put the spammers' search engines off the scent. When you click on an email link, you will have to change the address manually to make it work. At the moment I have only edited the html pages in this manner; doc and pdf files are unchanged. I have also uploaded a large number of false email addresses to a hidden html page, to give the search engines something to find.

I have visited several anti-spamming sites to see what others are doing. I could find no convincing proactive strategy, but all offer advice for avoiding spam Here's an edited version of spamrecycle.com's contribution…

- Never respond to spam.

- Never buy anything advertised in spam.
- Don’t put your address on any website.
- Use a second free email address in newsgroups, and change it frequently.
- Don’t give your email address without knowing how it will be used.
- Use a spam filter or other anti-spam email software.

The last point sounds good, but it may be impractical to keep updating filters. All sites I visited were short on specifics of how to do it. And you still get the spam, even if you don't see it.

You should also make sure that the address list of any mailing list you are on is not publicly accessible. People on the Sportscience mailing list and people mailing to the list are safe in this respect.

Here are a few more anti-spam sites, courtesy of Caroline Burge:

http://spam.abuse.net/
http://www.cauce.org
http://www.arachnoid.com/lutusp/antispam.html
http://www.sendmail.org/antispam.html
http://www.elsop.com/wrc/nospam.htm
http://www.junkbusters.com
http://tucows.myriad.net/spam95.html

Published Dec 2001
editor