**Sayegh E, Strauch R Does nonsurgical treatment improve longitudinal outcomes of lateral epicondylitis over no treatment? A meta-analysis. Clin Orthop Relat Res. 2015;473(3);1093-107.**

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Design: meta-analysis of randomized clinical trials

Purpose of study: to compare the effectiveness of nonsurgical treatment of lateral epicondylitis with observation only or with placebo

Reasons not to cite as evidence:

* The principal problem is that the forest plot for the meta-analysis assessing for overall improvement combines clinically heterogeneous interventions versus placebo
	+ For example, the first entry on Figure 3 reports outcome data for overall improvement from Bisset et al, where 128 patients were in the treatment group and 62 were in the no treatment group
	+ However, Table 1 shows that Bisset had three treatment arms: physical therapy (n=63), corticosteroid injection (n=65), and “wait and see” (n=62)
	+ Since 63+65=128, it is clear that PT and steroid injection have been analyzed as if they were a single intervention
	+ The same pattern is repeated throughout the meta-analysis as data from different randomized trials are pooled into a summary estimate of effect
	+ For example, Figure 3 proceeds to add data from Chesterton in the second line of the forest plot, who compared TENS (n=121) with counseling (n=120), and these are further combined with studies by Haker and Lundberg, who used laser in two studies and pulsed ultrasound in a third study
* A smaller problem with the analysis is that data appear to have been combined without assessing for credibility
	+ Petrella et al conducted a randomized trial in which 165 patients were treated with a sodium hyaluronate injection and 166 patients were treated with a normal saline injection
	+ In Fig 8-B, which combines data from three studies which measured maximum grip strength, a standardized mean difference is reported, in which the second study in the forest plot (Petrella et al) has a difference between treatment and no treatment equal to 12.78 standard deviations, where the mean grip strength in the hyaluronate group was 65.7 kg and was 45.6 kg in the normal saline group, for a mean difference of 20.1 kg in favor of the hyaluronate group
	+ A p value of less than or equal to 0.05 is generally interpreted as meaning that the probability of the study data showing a group difference equal or greater than the observed group difference, if there is truly no difference between the two treatments, is less than one in 20, and occurs when the difference between groups is approximately 1.96 standard deviations
		- The p value of 0.05 reflects an expectation that if the same experiment is repeated 100 times, approximately 5 experiments will show an effect size equal to or greater than the observed value, even if the “null hypothesis” is true, and the truth is that there is no difference between treatments
	+ Similarly, a p value of 0.01 means that if two treatments are equal in effect, a “significant” difference would arise purely by chance once for every 100 times the experiment was repeated
	+ For a group difference of 12.78 standard deviations, the p value would be approximately 2x10-37 , a very low probability indeed
		- Since the current estimate of the age of the universe is 13.8 billion years, this p value would mean that if Petrella’s study was repeated 21 billion billion times per second, beginning at the time of the Big Bang, a grip strength difference between hyaluronate and saline of 20.1 kg or greater would occur only once, if the two injections had an equal effect on grip strength
		- A more plausible scenario involves the possibility that Petrella’s study reported the average measured grip strengths of the patients together with the standard errors of the mean rather than standard deviations, and that transcribing these standard errors into Figure 8-B created the large standardized mean difference for that study