How to become an evidence-based practitioner: Interpretation of results and statistics

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The plan

- Diagnostic
- Intervention
- Secondary analyses

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- **Diagnostic**
- Intervention
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Reliability and Diagnostic Accuracy of the Lachman Test Performed in a Prone Position

The 2x2 Table:
Diagnostic Test vs. Gold Standard

	Disease Present (+)	Disease Absent (-)
Test Positive (+)	TP: True Positive	FP: False Positive
Test Negative (-)	FN: False Negative	TN: True Negative

"Gold Standard Test"

"Diagnostic Test"

- Non-intuitive labels:
  - Disease Present = Disease "Positive" (+) = Dz(+)
  - Test Positive = Test predicting disease present
  - From patient/provider point of view neither Disease Positive nor Test Positive (+) are good things!

Sensitivity

- Ability of the test to correctly identify (+ test result) in someone **with** the disorder
- = a/(a+c)
- SnNout = High **sensitivity** → **Negative** test result, rule **out** disorder w/ confidence
- False negatives are unlikely

TABLE 4 Lachman in Prone: 2-by-2 Contingency Table for All Patients

	Condition According to Reference Standard		
Condition According to Prone Lachman Test	Positive	Negative	Totals
Positive	16	1	16
Negative	7	28	36
Totals	23	29	52

= .70

Specificity

- Ability of the test to correctly identify (- test result) in someone **without** the disorder
- = d/(b+d)
- SpPin =High **specificity** → **positive** test result, rule **in** disorder w/ confidence
- False positives are unlikely

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= .97

TABLE 7 Diagnostic Values for the Prone Lachman Test*

Diagnostic Parameters	All Subjects Values (n = 52)
Sensitivity	0.70 (0.49, 0.84)
Specificity	0.97 (0.83, 0.99)
Positive predictive value	0.94 (0.77, 0.99)
Negative predictive value	0.80 (0.72, 0.83)
Positive likelihood ratio	20.17 (2.9, 141.1)
Negative likelihood ratio	0.32 (0.17, 0.59)
Diagnostic odds ratio	64.0 (7.2, 568.1)
Number needed to diagnose	1.5

*Value (95% confidence interval).

- Positive Predictive Value (PPV)
  - Ability of the test to correctly determine the % of people **with** the disorder from all of the people with positive test results
- Negative Predictive Value (NPV)
  - Ability of the test to correctly determine the % of people **without** the disorder from all of the people with a negative test result

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- Positive Likelihood Ratio (LR+)
  - Likelihood that a **positive** test result was observed in a person **with** the disorder v. in a person **without** the disorder of interest
- Negative Likelihood Ratio (LR-)
  - The likelihood that a **negative** test result is observed in a person **with** the disorder v. in a person **without** the disorder of interest

- If an LR = 1.0 it represents a 50:50 chance of increasing or decreasing the probability of a diagnosis
- A 95% CI that includes 1.0 in its range means that one possibility for the "true value" of the LR is a 50:50 chance

TABLE 7 DIAGNOSTIC VALUES FOR THE PRONE LACHMAN TEST*

Diagnostic Parameters			All Subjects Values (n = 52)
	Large and conclusive change		
	LR+ > 10	LR - < 0.10	
	Moderate change		
	LR+ = 5-10	LR- = 0.10-0.20	
	Small but sometimes important change		
	LR+ = 2-5	LR- = 0.20-0.50	
	Negligible change in pre-test probability		
	LR+ = 1-2	LR- = 0.50-1.0	
Sensitivity			0.70 (0.49, 0.84)
Specificity			0.97 (0.83, 0.99)
Positive predictive value			0.94 (0.77, 0.99)
Negative predictive value			0.80 (0.72, 0.83)
Positive likelihood ratio			20.17 (2.9, 141.1)
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Diagnostic odds ratio			64.0 (7.2, 568.1)
Number needed to diagnose			1.5

*Value (95% confidence interval).

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High-Intensity Interval Training and Moderate-Intensity Continuous Training in Ambulatory Chronic Stroke: Feasibility Study

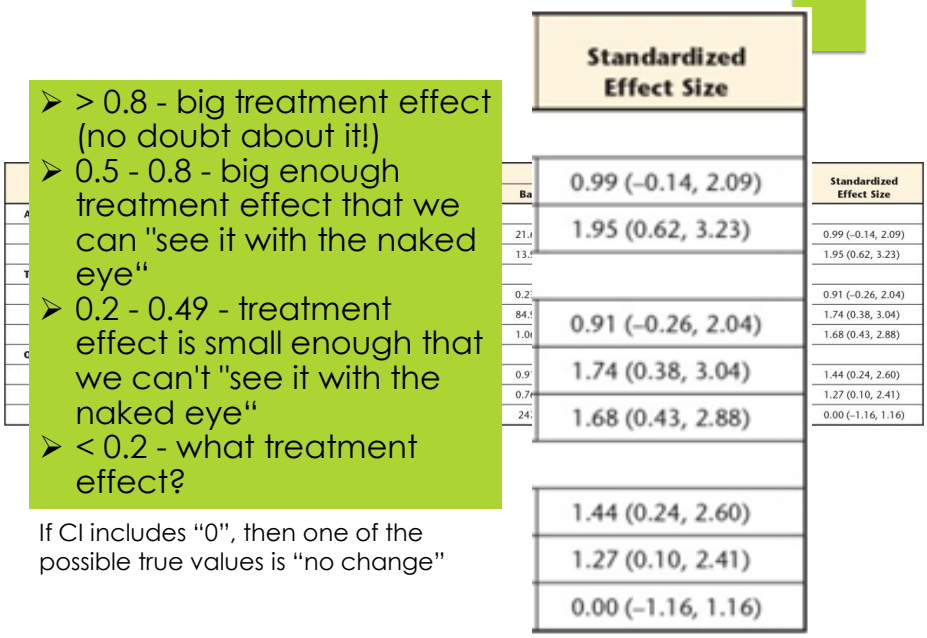
Pierce Boyne, Kari Dunning, [...], and Brett Kissela

Interpretation of results

- Statistical significance, p-value
  - Group differences
- Effect size
  - Expression of the size of the difference between sample means
- MCID (the "so what" to a test or measure result)
  - Minimal level of change required for the outcome to be considered worthwhile
  - Should at least exceed the standard error of measurement (SEM) for the outcome of interest

- > 0.8 - big treatment effect (no doubt about it!)
- 0.5 - 0.8 - big enough treatment effect that we can "see it with the naked eye"
- 0.2 - 0.49 - treatment effect is small enough that we can't "see it with the naked eye"
- < 0.2 - what treatment effect?

If CI includes "0", then one of the possible true values is "no change"



Number needed to treat

- Is it worth performing the intervention ?
- Number of patients who must receive the intervention in a specific period of time to produce one positive outcome or avoid one adverse event
  - 1 is ideal

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Treatment of Pediatric Obesity: A Systematic Review and Meta-Analysis of Randomized Trials

Lauren McGovern, Jonathan N. Johnson, Remberto Paulo, Allison Hettinger, Vibha Singhal, Celia Kamath, Patricia J. Erwin, and Victor M. Montori

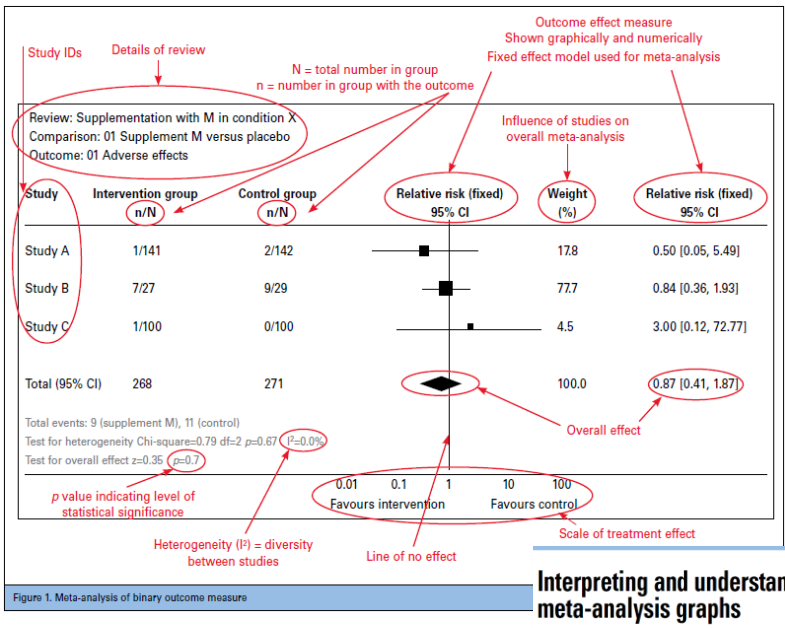
Comparison

Systematic Reviews

- A research design
  - Subjects = individual studies
  - Inclusion & exclusion criteria
  - Included studies undergo standardized evaluation process
- Purpose is to draw a conclusion from the cumulative weight of the evidence

Meta-Analyses

- Form of systematic review
- **Statistical analyses of data pooled** from individual studies included in the review
- Data compatibility from individual studies are necessary



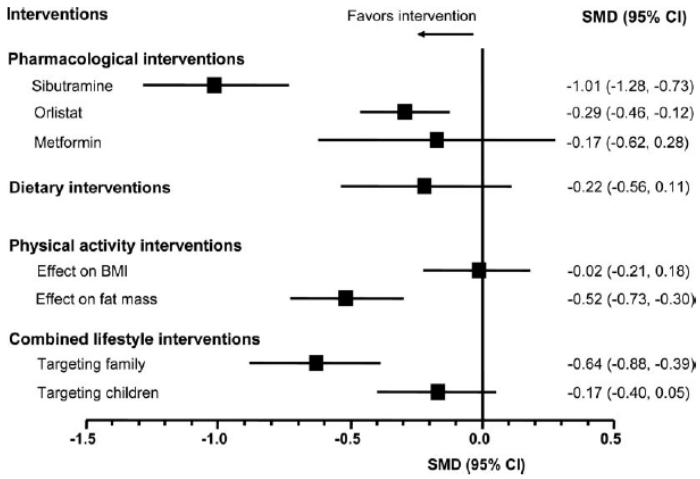


FIG. 2. Overall summary of meta-analyses results of randomized trials of treatments for pediatric obesity. Plot shows metaanalytic point estimates (■) and 95% CI (*horizontal lines*). SMD, Standardized mean differences.

Thank you

Questions?

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