Artifact Corrections in Meta-Analysis

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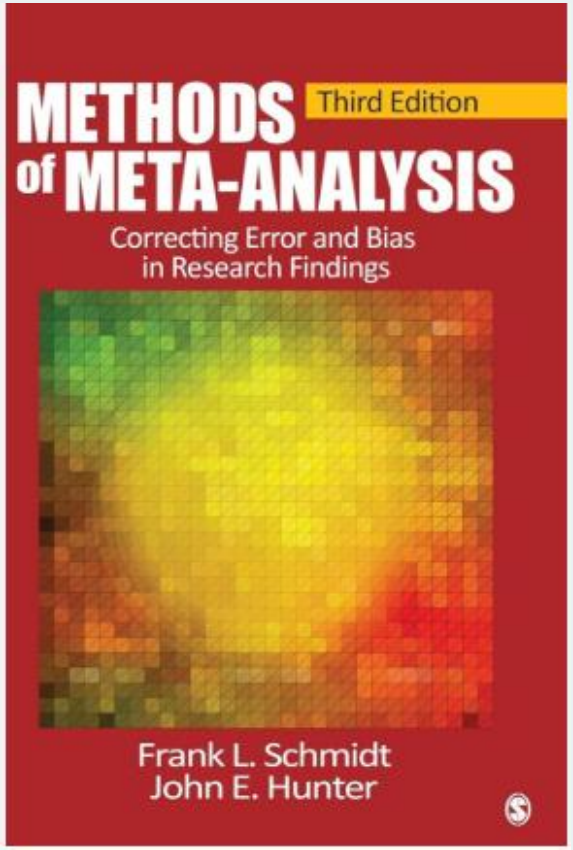
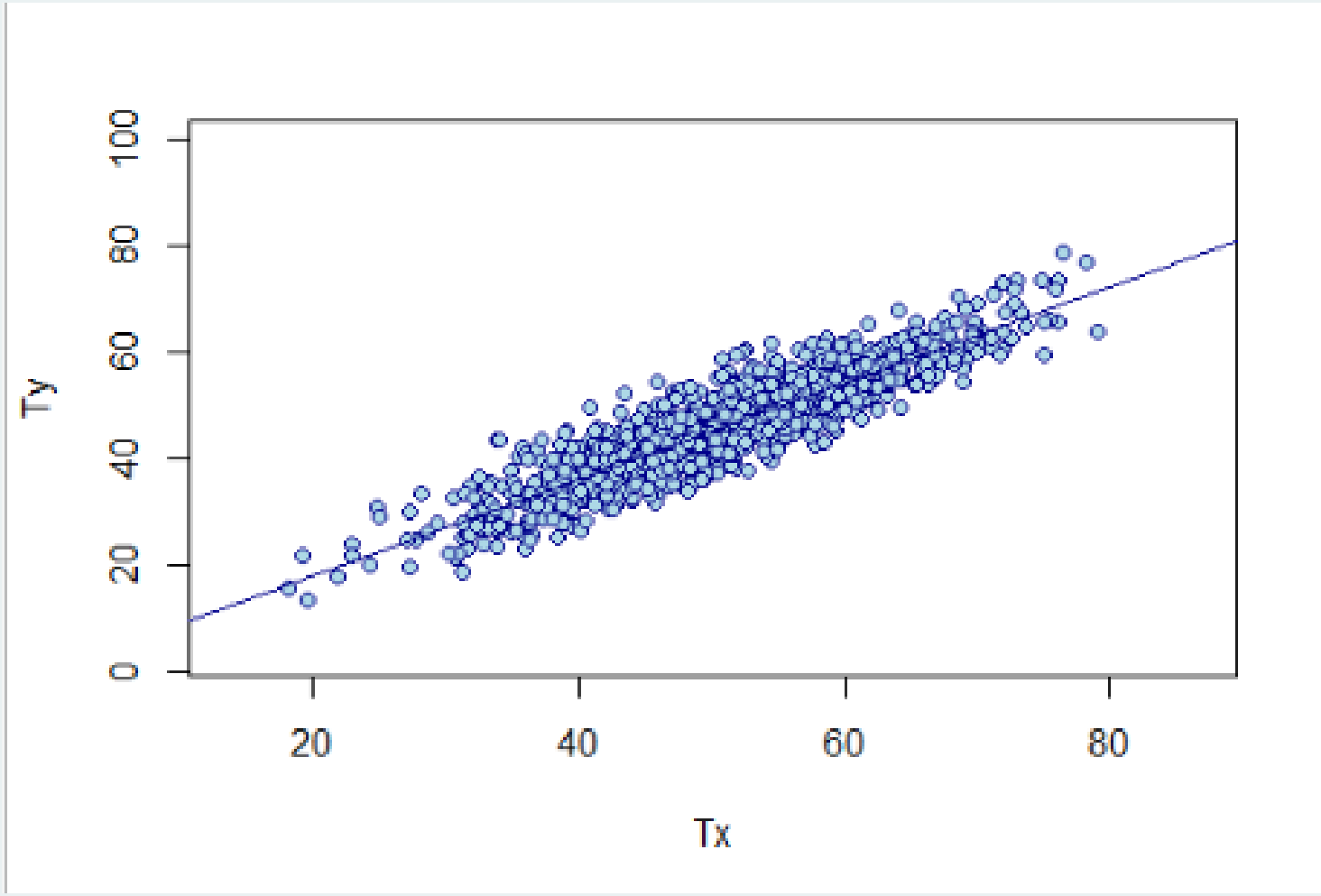
Statistical Artifacts



- Limitations of research data that fail to reflect the process under study and distort research results
- Factors that affect the *data*, but not the process of interest
- Artifacts impact mean and variance of effect sizes
- If you can model the how the artifact impacts your results, you can often create a statistical correction to reverse its effects
- Corrections are common in validation research, but relevant to other settings and effect sizes

Attenuation Due to Measurement Error

True Score
$r_{xy} = .9$



Obs Score
$r_{xx} = .7$
$r_{yy} = .5$

$r_{xy} = .59$

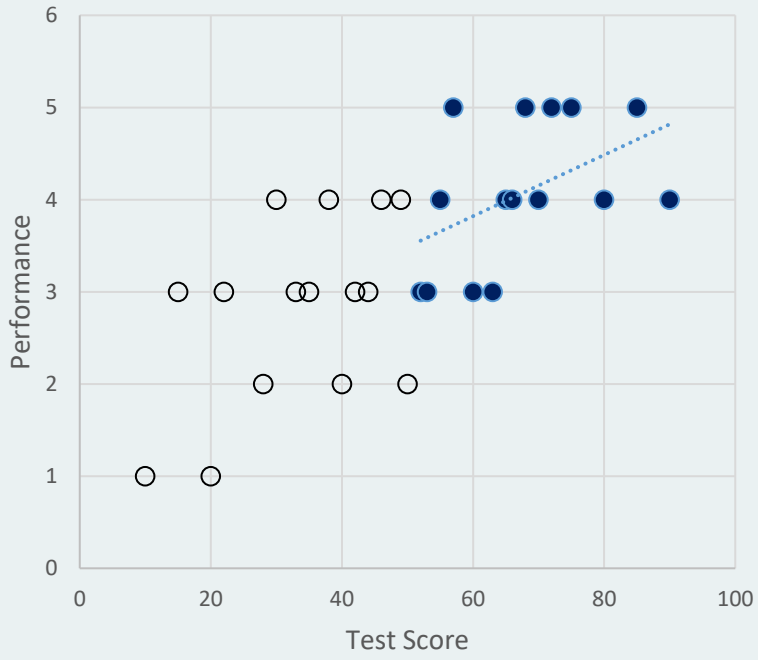
Correction for Unreliability

Correct For Unreliability of	Estimate correlation between:		Correction
	Predictor (x)	Criterion (y)	
Predictor (r_{xx})	True Score	Observed	$r_{T_x,y} = \frac{r_{xy}}{\sqrt{r_{xx}}}$
Criterion (r_{yy})	Observed	True Score	$r_{x,T_y} = \frac{r_{xy}}{\sqrt{r_{yy}}}$
Both	True Score	True Score	$r_{T_xT_y} = \frac{r_{xy}}{\sqrt{r_{xx}r_{yy}}}$

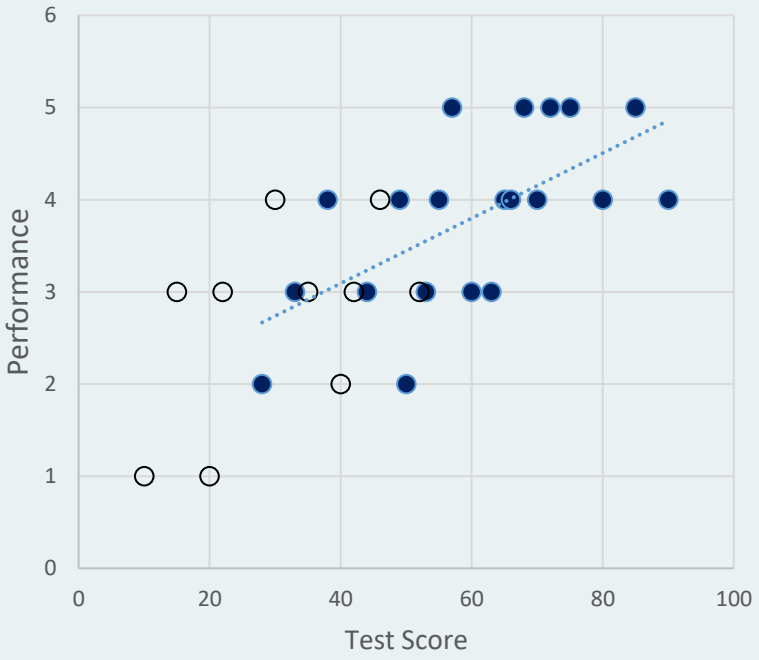
Range Restriction

Population

Direct RR



Indirect RR



Correction for Range Restriction

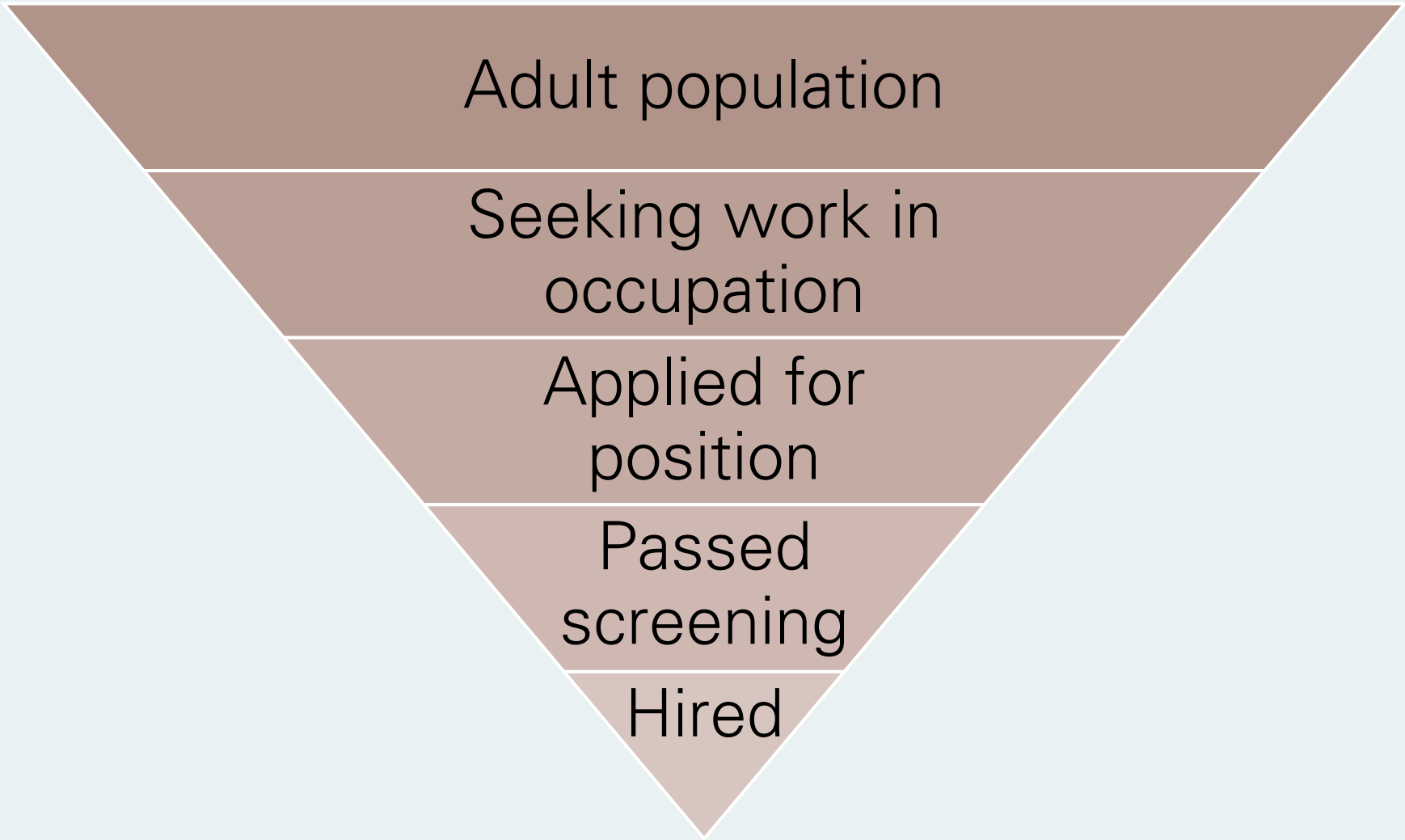
- Degree of Range restriction is determined from the SD of the predictor in restricted and unrestricted samples:

$$u = \frac{SD_{restricted}}{SD_{unrestricted}}$$

- Direct Range Restriction Correction

$$r_u = \frac{r_{xy}/u}{\sqrt{\left[\left(\frac{1}{u}\right)^2 - 1\right](r_{xy})^2 + 1}}$$

What is the Reference Population?



Skepticism about artifact corrections

- Validity of cognitive ability tests

Uncorrected	Schmitt & Hunter (1998)	Sackett et al. (2022)
.25	.51	.31

- Can we trust corrected estimates?
  - Does the correction match the inference?
  - Are the assumptions reasonable?
  - Do we have a good estimate of the artifact?

Concerns with Reliability Correction

- Assumptions of Reliability Corrections
  - Raters as parallel tests
  - Uncorrelated errors
- Borrowed reliability estimates (Lebreton et al., 2014)
  - Reliability of supervisor ratings of job performance: .52 (Viswesvaran et al., 1996) vs. .65 (Speer et al., 2024; Zhou et al., 2024)

Concerns with Range Restriction Correction

- Requires SD of unrestricted applicant population (SD_u) – often unknown
- Where do we get SD_u?
  - Test norms
    - Represent general population; ignores self-selection
  - Estimates of SD_u/SD_r from prior research
    - Does this generalize to the current context?
    - Sackett et al. (2022): RR estimates are mostly from predictive designs where RR is direct; inappropriate to use this to correct for indirect RR in concurrent designs

Recommendations

- Apply corrections, but interpret cautiously
- Match correction to context and inference
- Report results with and without correction
- Transparency
  - What corrections were applied?
  - Where did artifact values come from?

References

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Thank you

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