

Pre-registration – the challenge of secondary data

Gary Lewis

Goal

- Informal and basic overview of:
 - Replication issues in psych
 - Pre-registration and registered reports as a possible solution
 - The difficulties extending this approach to secondary data
- Stop me throughout; fine with ongoing discussion.

The problem

- Clear issues of replicability
 - Psychology; economics; biomedicine etc
 - e.g. John Ioannidis
- Time/resources wasted
- Meant to be standing on the 'shoulder of giants'
 - But often not the case...

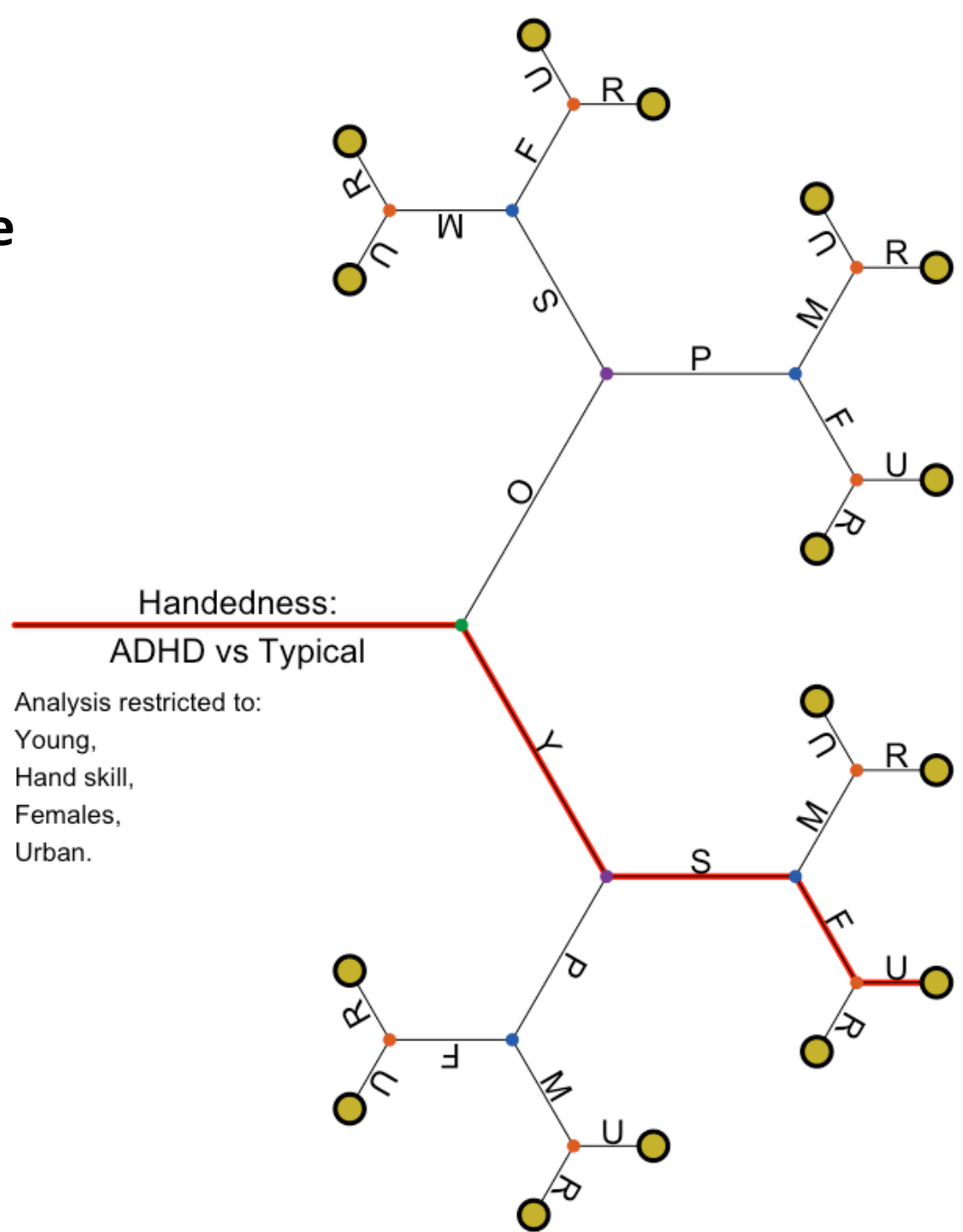
Some reasons

- Questionable incentive structures
 - REF; job market/hiring agenda
- Experimenter degrees of freedom
 - Changing/omitting IVs or DVs after results are known
 - Checking p half-way through data collection
 - Trying a different pipeline or analysis tool
 - Post-hoc theorising (i.e. exploratory work presented as confirmatory)
 - HARKING
- Publication bias
 - Can lead to very misleading conclusions

Large population database used to explore link between ADHD and handedness

Focus just on Young, Urban, Females on measure of hand skill: 16 contrasts at this level

Probability of a 'significant' p-value < .05 = .56



Pre-registration

- Analysis plan that precedes the data collection
- Published somewhere like aspredicted.com or the OSF
- Obviously won't stop fraud
- BUT does raise confidence for others that results are not p-hacked
 - Would encourage me to build on others findings

Registered reports

- Introduction and Methods are submitted
- Reviewed and (hopefully) 'accepted in principle'
- Then data is collected
- Same benefits as for PR
 - But also tackles publication bias
 - i.e. if the question is interesting/important, and the method sound, it will be published.

Lots of Arguments for and against

- Against
 - Too constraining; most good science is serendipitous; RR may lead to journals with loads of null findings; hard to interpret null findings
- For
 - P-hacking is rife – time to make a step-change; PR/RR will shape how researchers prepare their studies; we can all have more certainty about the expectations of others; power analysis will become more readily used

Secondary Data

- PR and RR targets primary data
 - Obviously more so for RR
- But many work with secondary data
 - Many large scale cohort studies; twin studies etc
- RCUK encourage this practice
- Scarce funding makes it essential for those who wish to actually do some science
- Good statistical power easier to achieve

SIPS suggestions

- Use PR
- Commit to the basic principles of open science
 - e.g. transparent reporting
- Defining analytical design
 - e.g. criteria for model fit; estimation methods
- Links to full version of variables used
- Posting code to the OSF
 - And write code before analysis
- Discovery and validation datasets
- Clearly demarcate confirmatory from exploratory

Other possibles

- Specifically for RR
 - Intro and methods as per primary data
 - But have discovery and replication sample
 - Allow reviewer to select the participant IDs that make up the datasets
 - Have an independent reviewer design the analysis plan
 - Do they become an author?
 - Cohort managers to only release data once it has been accepted as RR?
 - Cohorts to collect data that has been accepted as an RR
 - Crowd-sourcing science?

Other issues

- Analyses can be extremely tricky
 - Not easy to pre-register
 - Many steps on the analysis pipeline; some contingent on the earlier steps
 - This is the exact problem PR/RR is meant to address, but writing up the doc could lead to very large number of contingencies.
 - Do we need more concrete standards/decision rules in the field?
 - To some extent this is overstating the problem – lots of consensus of various approaches, such as in BG

Exploratory Reports

- Some journals now accept exploratory reports
 - e.g. Cortex
- One possible solution
 - At least for cohort data-mining

Final thoughts

- Important that the PR/RR debate extends to secondary data
- Diverse inputs needed
 - There are a variety of interested parties
- Institution/agency/researcher interactions
 - Cohorts working with PR/RR in mind
- Harmonisation for analysis pipelines might be valuable

To the floor...