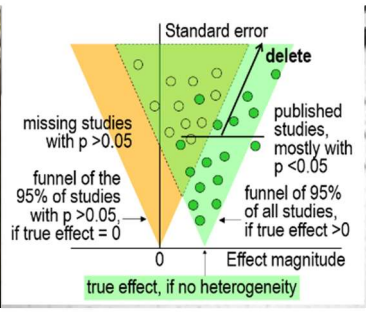
PARIS LODRON UNIVERSITY SALZBURG | Sport and Exercise Science

Guest Lectures

Will G. Hopkins

Professor in Research Methods and Statistics (retired 2022)
Institute for Health & Sport
Victoria University Melbourne
Australia



Guest Lecture Announcement

Einladung zu Gastvorträgen

Dear colleagues,

the Department of Sport and Exercise Science cordially invites you to participate in the guest lectures by Will G. Hopkins.

Topics:

Misuse of standardization to meta-analyze differences in means

Tuesday 21 November, 2023
Time: 15:15 - 16:45

Confidence intervals and meta-analysis resolve the replication crisis

Wednesday 22 November, 2023
Time: 13:30 - 15:00

Lecturer: Prof. Will G. Hopkins
retired this year
Location: HS3 Schloss Rif
Schlossallee 49, 5400 Hallein-Rif
Contact:
alexander.koesters@plus.ac.at

no entrance fee

Prof. Will G. Hopkins
Research Methods and Statistics

Content of the talks

Misuse of standardization to meta-analyze differences in means

Meta-analysts often use standardized mean differences (SMD) to combine mean effects from studies in which the dependent variable has been measured with different instruments or scales. The SMD is properly calculated as the difference in means divided by a between-subject reference-group, control-group, or pre-intervention standard deviation (SD), usually free of measurement error. When combining mean effects from controlled trials and crossovers, some meta-analysts divide instead by an SD of change scores, resulting in SMDs that have no useful interpretation and that can underestimate or grossly overestimate the magnitude of the intervention. Others standardize using only post-intervention means and pooled SD, which usually results in reduced precision of the SMD and underestimation of the SMD arising from individual responses to the intervention. These misuses of standardization were frequent in recent meta-analyses in medical journals we surveyed; they arise apparently from misleading advice in peer-reviewed publications and from inappropriate use of popular meta-analysis packages. In any case, meta-analysis of any form of SMD increases heterogeneity artifactually via differences in standardizing SD between settings. We therefore favor other approaches to combining mean effects of disparate measures: log transformation of factor effects (response ratios) and of percent effects converted to factors; rescaling of psychometrics to percent of maximum range; and rescaling with minimum clinically important differences. If meta-analysts cannot adduce clinically important thresholds for mean effects, standardization *after* meta-analysis with appropriately transformed or rescaled chosen or pooled pre-intervention SDs is a fallback for assessing magnitudes of a meta-analyzed mean effect in different settings.

Confidence intervals and meta-analysis resolve the replication crisis

Different studies of the same effect sometimes produce markedly different results, a phenomenon dubbed the replication crisis. Significance testing and sampling variation provide simple explanations for much of the apparent crisis, whereas compatibility and Bayesian interpretations of confidence intervals identify real replication failures. These failures are quantified as heterogeneity in random-effect meta-analysis, which can apportion at least part of the heterogeneity in a given effect to the modifying effects of subject characteristics and study methodologies. Meta-analysis can also identify and discount heterogeneity due to publication bias and the occasional scientific fraud. Any remaining unexplained heterogeneity does not constitute a replication crisis.