

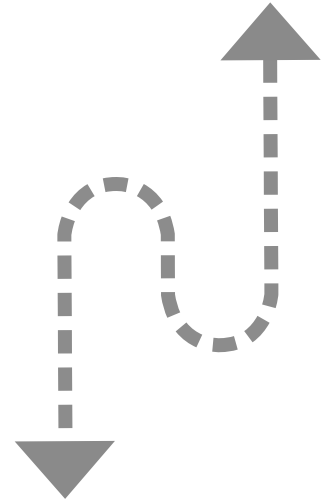


Effect size indices of a treatment and review of session-by- session measures

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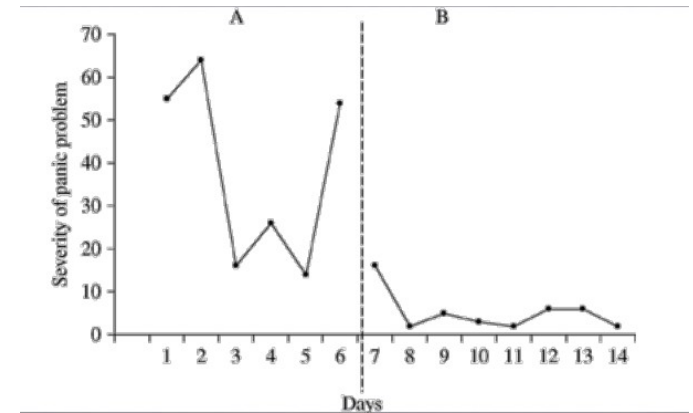
Our objectives

- ***To create a script*** in R language able (a) to select the best method to use to compute the effect size of a treatment in a single case design and (b) to print an output readable by both researchers and practitioners;
- To ***review the measures*** used in single designs repeatedly (session-by-session) and useful for the aims of the project.



The terms

- **Single case design**: Research design in which the subject is also his/her own control
- **Effect size index**: index of the strength of an effect, is composed by a number indicating the strength (null, small, medium, large) and a sign indicating the direction of the effect (- = decrease; + increase)



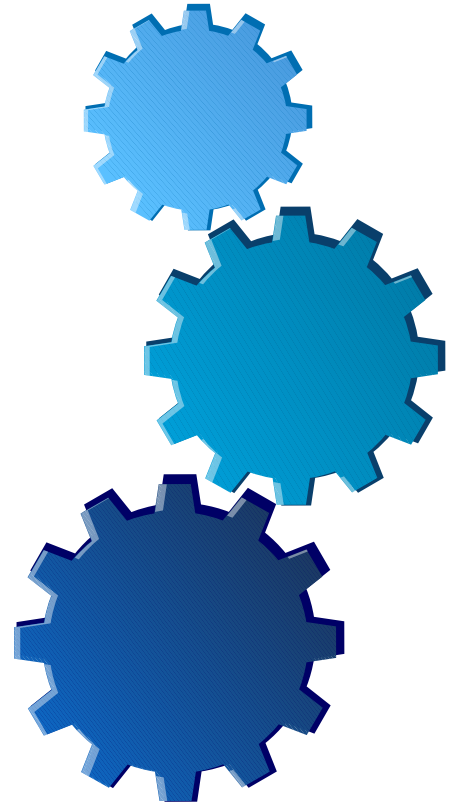
The script



The script

The creation of the script required the following steps:

- Writing an R-code for the computation of two different effect size indices: Allison and Gorman's (1993) index (parametric) and Parker et al.'s (2011) index (non-parametric)
- Development of a method to choose the better solution between the two possible effect size indices:
individuation of a method, translation into an algorithm in R-code, test with simulated and real data
- Writing of a final script containing the previous steps and able to print a final output with two possible layouts (a synthetic and an extended one)



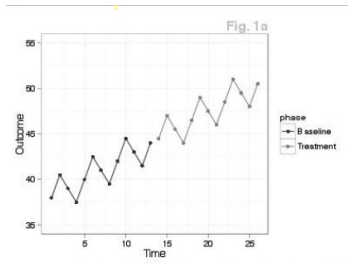
The script

WRITING OF AN R-CODE FOR THE COMPUTATION OF TWO DIFFERENT EFFECT SIZE INDICES

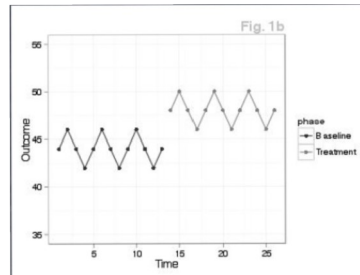
Allison and Gorman's (1993) index (parametric)

It is a regression model that takes into account the effect of treatment on both level and slope of the outcome of interest, and it also controls for the trend of phase A.

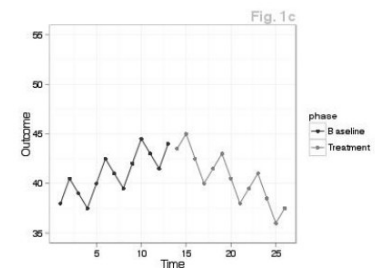
TREND



LEVEL



SLOPE



The R^2 that results from the regression is converted into an effect size index.

The script

WRITING OF AN R-CODE FOR THE COMPUTATION OF TWO DIFFERENT EFFECT SIZE INDICES

Parker et al.'s (2011) index (non-parametric)

It combines nonoverlap (Mann-Whitney U test of nonoverlapping) with trend (Kendall's Tau coefficient, a measure of monotonicity)

A vs B

A vs B + Trend B

A vs B + Trend B – Trend A

The script

DEVELOPMENT OF A METHOD TO CHOOSE THE BETTER SOLUTION BETWEEN THE TWO POSSIBLE EFFECT SIZE INDICES

Choosing the best method to use: Montecarlo simulation

This is a technique that provides probability distributions of different outcomes

We created populations with different characteristics and a total of 2.800.000 samples were extracted.

We computed both R^2 and Kendall's Tau for each sample, then we calculated a percentual bias and an absolute indicator of bias and other parameters (length of data series, measures of errors) through which we obtained important information as the fact that TAU and R^2 bias decrease as the length of the phase increase



The script

DEVELOPMENT OF A METHOD TO CHOOSE THE BETTER SOLUTION BETWEEN THE TWO POSSIBLE EFFECT SIZE INDICES

Predicting bias

We splitted all the Montecarlo samples in two groups (training group and validation group) and we used them to compare predicted values and actual Montecarlo values.

Predicted values were computed through two models (one for R and one for Tau bias) estimating the probability to obtain not biased trend estimations.



The script

**DEVELOPMENT OF A METHOD TO CHOOSE THE BETTER SOLUTION BETWEEN
THE TWO POSSIBLE EFFECT SIZE INDICES**

Predicting bias

MODEL ACCURACY

(ability to predict a not biased trend estimation)

R bias accuracy

72.43%

Tau bias accuracy

83.01%

The script

DEVELOPMENT OF A METHOD TO CHOOSE THE BETTER SOLUTION BETWEEN THE TWO POSSIBLE EFFECT SIZE INDICES

Algorithm to choose the best method to use

The the final algorithm is composed of the following parts:

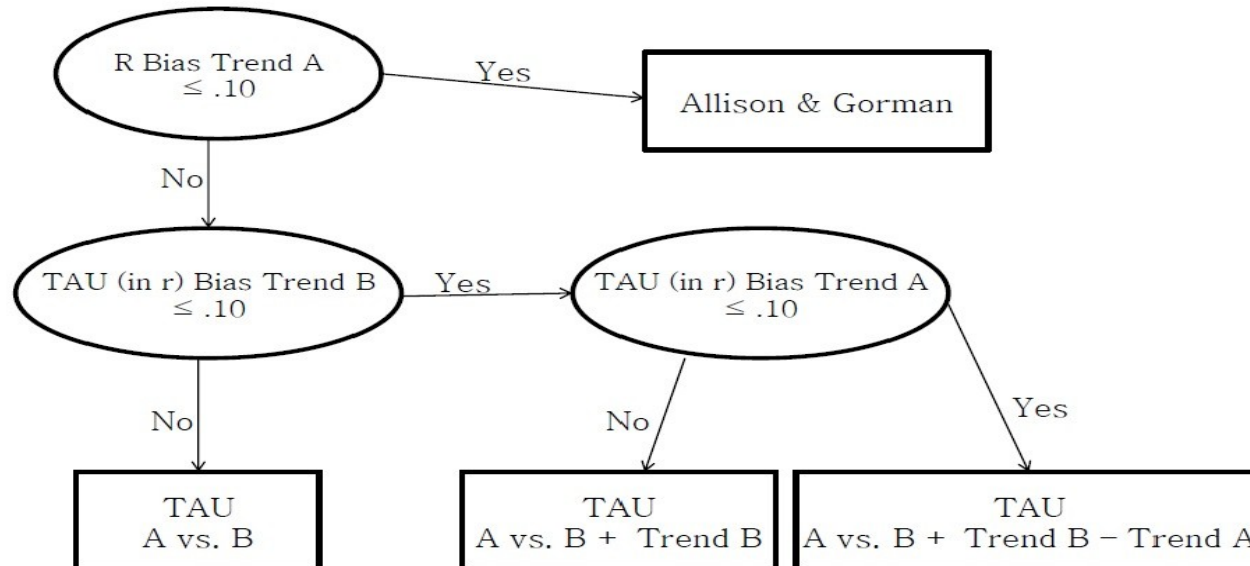
- for each dataset and each phase, it computes length, TAU in r metric, R, MASE for both the regressions and the Theil-Sen models;
- for the baseline, it estimates bias both of TAU and R biases;
- for the treatment phase, it estimates TAU bias;
- it applies a if-then logic (see the following slide)



The script

DEVELOPMENT OF A METHOD TO CHOOSE THE BETTER SOLUTION BETWEEN THE TWO POSSIBLE EFFECT SIZE INDICES

Algorithm to choose the best method to use



The script

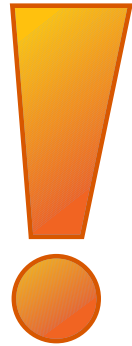
DEVELOPMENT OF A METHOD TO CHOOSE THE BETTER SOLUTION BETWEEN THE TWO POSSIBLE EFFECT SIZE INDICES

Algorithm to choose the best method to use

Finally, we tested the algorithm on real data from 100 published single case design

Results:

- Allison & Gorman was the best method 13.68% of the time,
- TAU-U AvsB+trendB-trendA 8.42% of the time,
- TAU-U AvsB+trendB 12.63% of the time,
- TAU-U AvsB 65.26% of the time

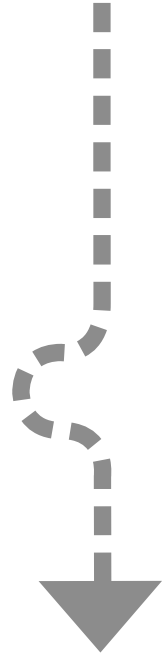


Review of measures



Reviewing measures

Our objective was to individuate session-by-session measures used in single case designs in order to have examples of brief and flexible instruments to monitor the behaviors of interest

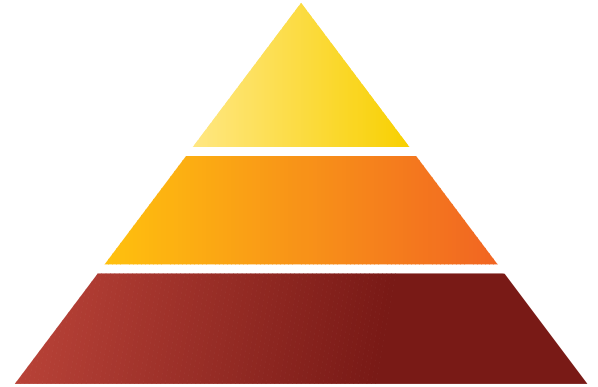


Reviewing measures

First step

Individuating paper describing:

- single case design
- focused on **children** with SEBD
- brief measures (1 to about 5 items)



Reviewing measures

First step - Children Main results

- 80 studies;
- Highly frequent use of behavioral observation
- Cases relying on rating scales, frequently used items to measure fear and anxiety

Reviewing measures

**First step - Children
Main results**

Children report example

Degree of anxiety (0 = none to 4 = very much)

Fear rating (0 to 4 numerical rating matched with faces)

Reviewing measures

**First step - Children
Main results**

Parents report example

Bad mood rating (1 = bad mood to 5 = good mood)
Fear rating (0 = none to 8 = very much)

Reviewing measures

Second step

Individuating paper describing:

- single case design
- focused on **adults**
- brief measures (1 to about 5 items)



Reviewing measures

Second step - Adults Main results

- 51 studies;
- Great part of the cases relied on rating scales, balanced across different disturbs: SUDS is one of the most used

Reviewing measures

Second step - Adults
Main results

Examples

Subjective Unit of Distress Scale
Anxiety level (1 = no anxiety to 10 = high anxiety)

Level of anger (1 = completely calm to 10 = extremely
angered)

Reviewing measures

Second step - Adults
Main results

Examples

Visual Analogue Scale-VAS (very flexible)

0 _ _ _ _ _ 100

(Frequency, distress, etc.)

Reviewing measures

The results are presented in a spreadsheet containing:

- 2 sheets (one for children and one for adults);
- in each sheets: titles of the paper ordered for type disturb, brief presentation of the measures of interest, direct link to the paper (folder containing all the papers)



**Output and material
produced**



Concluding

Output and material produced

- Report containing the script in R-code embedded in the BEHAVE application, the Montecarlo study, and the description of the reviewed measures;
- Database of 100 real cases on which the script has been tested;
- Excel file containing all the reviewed paper correlated with a folder containing the papers themselves

***THANK YOU
FOR YOUR ATTENTION!***

