SCED Analysis Guide
SCDA and SCD-effect-sizes Shiny Web Apps

	Analysis software	**Link**
Visual	SCDA shiny web app	https://tamalkd.shinyapps.io/scda/
Baseline trend	Tau online calculator	http://ktarlow.com/stats/tau/
Statistical	SCD-effect-sizes shiny	https://jepusto.shinyapps.io/SCD-effect-sizes/

*See Single-case_software table for full overview of analysis techniques capable in each software.

AB-F/U design

– Example case in Adult mental health outpatient setting (Case Description Three)

Practical task resources

1. Example Excel dataset with idiographic and nomothetic measures (‘*AB-FU_dataset.xlsx*’)
2. Reference papers for the nomothetic measures to inform RCSI analysis.
3. Single-case-V8 Excel workbook and manual for nomothetic RCSI analysis.
4. Template PowerPoint with tables etc. to input findings to feedback.

Overview of analysis stages included in guide

1. Inspect the data
2. Visual analysis (using time series plots and visual aids)
3. Assess for trend in the baseline
4. Statistical analysis (compute non-overlap effect sizes)
5. Overview of data (phase means & SD)
6. Repeat stages 2-5 for each idiographic outcome
7. Reliable and clinically significant change (RCSI) analysis for nomothetic outcomes
8. Report all the findings
    i. Use PowerPoint template to present results in teaching session
    ii. See the example results for analysis table templates for reporting for your SCED assignment

<u>For your assignment data</u>

See end of the guide for additional tips about how to customise plots from the shiny apps by adding phase and axis labels and median trend lines in Microsoft Word (Box 1).

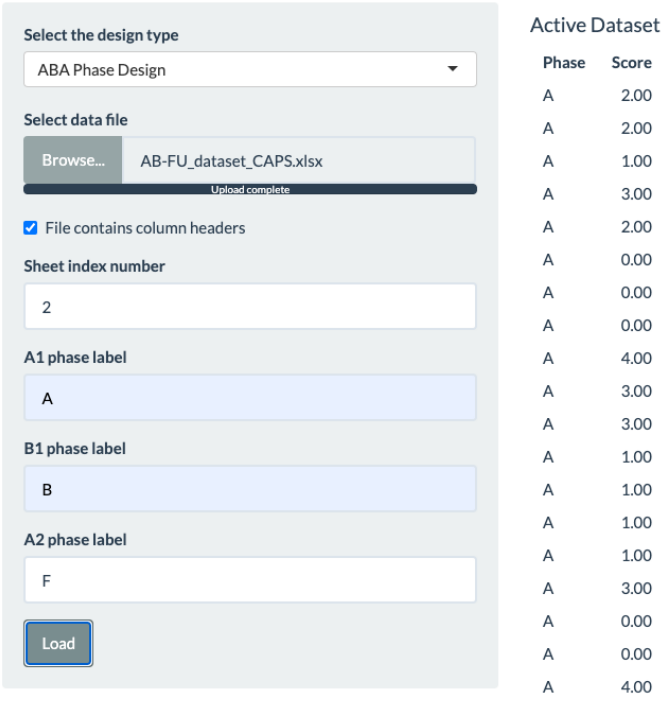
Step-by-step guide for analysing the data

INSPECT THE DATA

1. Open the Excel workbook named '*AB-FU_dataset.xlsx*' and inspect each tab to get an understanding of the data. The first tab contains a dataset overview including the design, phase lengths and summary of idiographic & nomothetic measures. Data for each idiographic measure is included in a separate tab. The final tab contains the nomothetic outcomes.

VISUAL ANALYSIS

2. To perform the visual analysis, open the SCDA Shiny web app using the link https://tamalkd.shinyapps.io/scda/. Click on the '**Data**' tab from the menu at the top of the page. You will need to upload data in Excel file with the data formatted in 2 columns – one labelled Phase and one labelled Score (the data in the example dataset has been formatted in the required format).



First, select the '**Design type**' from the drop down menu (e.g. ABA phase design to plot 3 separate phases). Click '**Browse**' and locate and open the '*AB-FU_dataset.xlsx*'. Ensure the '**File contains column headers**' is checked and input the '**Sheet index number**' for the corresponding tab for the first measure in the Excel workbook (i.e., ID1- Relationship is on sheet 2). Ensure the A1, B1, A2 '**Phase labels**' match how they are labelled in the dataset (A, B & F – see screenshot) then click '**Load**'. The data should be displayed on the right as shown in the screenshot above.

3. Click the '**Visual Analysis**' tab on the top menu. In the '**Plot Observed Data**' panel, ensure the '**Design Type**' and '**Phase Labels**' are correct. If you want to change/customise the axis labels you can input your own into the '**Axis label'** boxes. Input the minimum and maximum value for the scale used for the idiographic measure in the boxes provided and then click '**Plot**'. A plot of the data will appear on the right hand side.

4. The side-panel menu on the left hand side can be used to produce plots with different visual aids, including central tendency lines, trend lines and variability bands. Explore the different options (they are all plotted using the same settings as the *Observed data* plot).

5. Use the '**Plot Estimate of Trend'** panel to produce a plot with trend lines added for each phase. You can choose whether to use *Split-middle* trend lines or *Least Squares regression* trend lines from the '**Select the trend visualization**' drop-down box. Right-click on the plot to save a copy to your computer or copy and paste into the PowerPoint template.

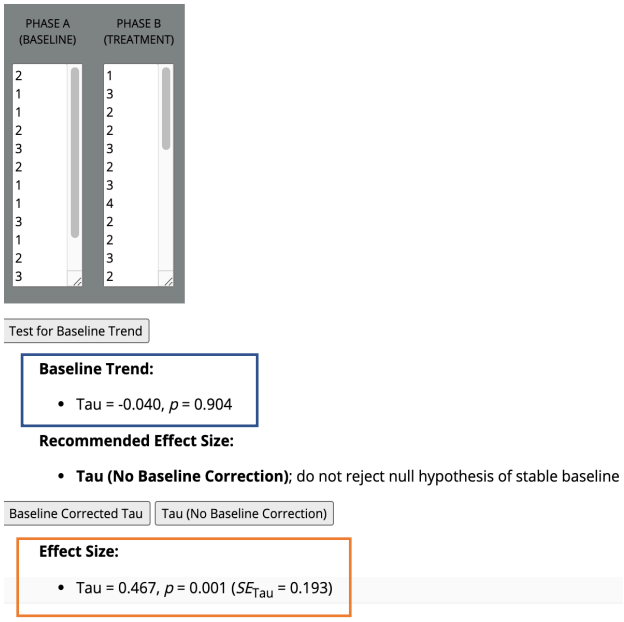
Note: *Before downloading the plot, you can adjust the size by increasing or decreasing the size of your browser window. The plot will rescale accordingly. For your SCED assignment, a plot with trend lines rather than central tendency levels may be most applicable for the requirements. See Box 1 on page 5 for tips on how to customise the plots, such as adding the baseline median trend line or a legend. Alternatively see one of the other Analysis Guides for other methods of visually plotting data if you would prefer to use a different method in your assignment.*

ASSESS BASELINE TREND

6. To assess the baseline trend, open the Tau online calculator http://ktarlow.com/stats/tau/. Copy the A baseline phase scores for an idiographic outcome (i.e., ID1 – relationship from the 2nd tab in the Excel dataset) and paste them into the '**PHASE A (BASELINE)**' box. Copy the B intervention phase scores for the same idiographic outcome and paste them into the '**PHASE B (TREATMENT)**' box (see screenshot). Click '**Test for Baseline Trend**'.

   First, establish whether there is a significant baseline trend and record the '**Baseline Trend**' Tau value (e.g. Baseline Trend Tau=-0.040, p=0.904). Based on the significance of the baseline trend, a '**Recommended Effect Size**' is provided.

   Click the relevant option – if Baseline Trend is significant (p<0.05), select '**Baseline Corrected Tau**' (will produce $Tau^{AvsB - trendA}$) or if Baseline Trend is not significant, select '**Tau (No Baseline Correction)**' (will produce Tau^{AvsB}). Report the Effect Size displayed for the phase A vs B comparison (e.g. Recommended effect size: Tau=0.467, p=0.001).



Note: *For your assignment, repeat step 6 for each of the idiographic measures you have collected and record the results in a table (see e.g. results for example template)*

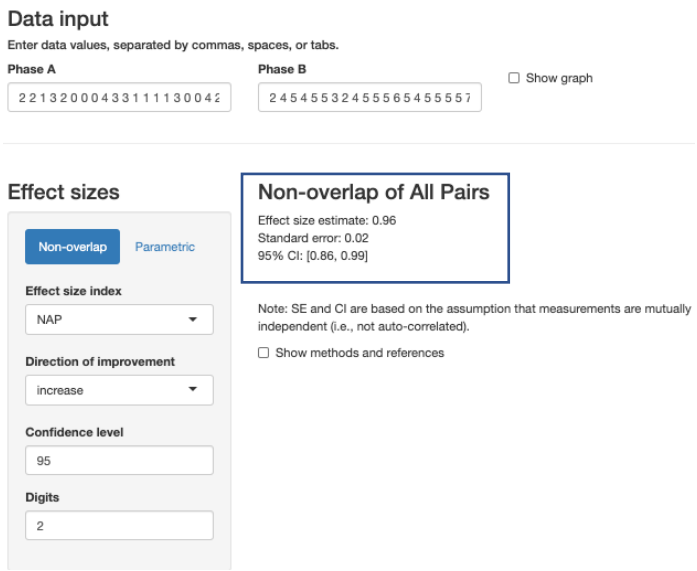
STATISTICAL ANALYSIS

7. To perform the statistical analysis, open up the SCD-effect-sizes Shiny web app using the link https://jepusto.shinyapps.io/SCD-effect-sizes/. Click on the '**Calculator**' tab from the menu at the top of the page. Copy the A baseline phase scores for ID1 – relationship from the Excel dataset and paste them into the '**Phase A**' box. Copy the B intervention phase scores

for ID1 – relationship from the Excel dataset and paste them into the '**Phase B**' box (see screenshot below).

8. In the **Effect sizes** panel, select '**Non-overlap**'. From the drop-down '**Effect size index**' menu select one of the effect sizes. Ensure the '**Direction of improvement**' is correct for the idiographic measure. Can leave the other settings on the defaults.

NOTE: *different idiographic measures for the same case may have different directions of improvement so ensure the correct '***Direction of improvement***' setting is selected based on the direction of improvement of each measure – E.g. for the example case we want to increase the clients relationship quality so the aim of the intervention for ID1_relationship is increase. However, we want to reduce the number of flashbacks so the aim of the intervention for ID3_flashbacks will be reduce.*



The effect size is displayed on the right of the box (e.g. NAP = 0.96). To convert the value to a percentage, multiply it by 100. Select and record the effect sizes for at least 3 of the non-overlap statistics. Tables have been provided in the template PowerPoint to help you feedback the results.

Note: *The PEM calculation used in this Shiny app adopts a slightly different formula – phase B data points that are equal to the phase A median are counted as half a data point (Giannakakos & Lanovaz, 2019).*

Note: *Although Tau and Tau-U are effect size options, there is no accompanying test of baseline trend and p value to help determine which metric is most appropriate for the data unlike in the Tau online calculator.*

By checking the '**Show graph**' box, a plot will be provided, however it will only plot two phases at once (i.e. AB) and does not allow trend lines to be added. By checking the '**Show methods and references**' box, more information about the calculation of the effect size will be displayed.

Repeat (if you have time) to obtain between-phase comparison effect sizes for;
- **A** and **F/U** scores (Baseline vs Follow-up)

Note: If you have used an AB-FU design for your SCED assignment, also include phase comparisons between the baseline (A) and follow-up (FU) phases by repeating steps 2-8 for each idiographic measure. See the e.g. results document for an example table template for how to report the multiple phase comparison statistics.

DATA OVERVIEW

9. In the Excel dataset use formulas to compute and report the Mean [=AVERAGE(*cell range of scores*)] and SD [=STDEV(*cell range of scores*)] for each phase separately.

10. For your assignment, repeat steps 2-9 to produce the visual and statistical analysis for the remaining ideographic measures (e.g. ID2 & ID3 in the example).

RCSI ANALYSIS FOR NOMOTHETIC OUTCOMES

11. To assess whether the client experienced reliable or clinical change on the nomothetic outcomes, either use reported reliable change and clinical thresholds for that measure if available (e.g. Connell et al, 2007 paper for CORE-OM – the criteria are provided in the first tab of *AB-FU_datasets.xlsx'*).

    For your assignment, if reported values are not available for the measure you have used, you can calculate the criteria to establish reliable change yourself. Open the Excel workbook named '*single-case-V8.xlsm'*. You may need to enable macros in a pop up box. There is an accompanying manual for detailed instructions ('*Manual-for-Leeds-RCI-CSC-calculators.pdf*').

    On the '**Data**' tab, input the Pre-baseline and Post-intervention (B) scores from the '**Nomothetic Outcomes'** tab in the example dataset where indicated. To calculate *reliable change*, input information about the measure including the **lowest** & **highest** possible scores, the **direction of clinical gain** and the **reliability** of the measure (internal consistency Cronbach's Alpha).You will also need to input the **SD for clinical norms** in cell C27. This information will be available in the psychometric evaluation paper for the measure provided.

    The box in cell C11 will show whether the client has improved, deteriorated or shown no change. In the **'Results'** tab, cell C17 will show the RCI value – amount of change required to be deemed reliable. Repeat for Pre-baseline score to post-intervention (C) score.

    If it makes conceptual sense for the measure to have a clinical threshold, you can also determine whether *CSC* is present. If an established clinical cut-off has been determined in the psychometric evaluation of the measure, then use this threshold. If not, the **Means and SDs of clinical & comparison norms** can be inputted on the '**Data**' tab to produce a clinical cut-off value (CSC criteria – see manual for more info on which criterion to use).

REPORT FINDINGS

12. Prepare a brief overview of the findings to feedback to the group (e.g., a few PowerPoint slides – can use the template provided). Focus on summarising the stages of analysis and demonstrating the types of output from the Shiny app (types of visual plots, overlap statistics etc.).

    Note: *For your SCED assignment, see the e.g. results document for a table templates for reporting the statistical analysis and examples of how to interpret the effect sizes.*

Box 1: Tips for manually customising plots

Use Word 'Insert' and 'Formatting' functions to manually customise the plots.

- Use text boxes to add 'Baseline' and 'Intervention' labels to phases or a title for the plot if required (Insert > Text box).
- Can also insert text boxes over the axis labels to customize the label to your requirements or to add a legend explaining the trend lines etc..
- Insert a line to draw the baseline median across all phases or split-middle trend lines in the plot (Insert > Illustrations > Shapes > Select line). If you press 'shift' when drawing the line it will make sure it is horizontal/vertical. Format the shape to change the colour of the line, increase the thickness or make it dashed etc.
- Hold down the 'shift' key and select all the added features (text boxes, lines etc.). Without clicking anywhere else (so the items all remain selected), right click and select Group > group to combine all the added features into one object so they remain in the right place when moving the plot.

See 'AB-FU_eg_results' document for an example of the ID1_relationship.