Glossary of SCED Statistics

NON-OVERLAP MEASURES

Percentage of non-overlapping data (PND)

Scruggs, Mastropieri, & Casto (1987) proposed the percentage of non-overlapping data (PND) as an effect size index for single-case designs. For an outcome where increase is desirable, PND is defined as the proportion of observations in the B phase that exceed the highest observation from the A phase. For an outcome where decrease is desirable, PND is the proportion of observations in the B phase that are less than the lowest observation from the A phase.

This effect size does not have a stable parameter definition because the magnitude of the maximum (or minimum) value from phase A depends on the number of observations in the phase (Allison & Gorman, 1994; Pustejovsky, 2018a).

PND has severe limitations as an effect size index. In particular, its magnitude is influenced by the number of observations in the baseline phase (Allison & Gorman, 1994; Pustejovsky, 2018), which makes it difficult to interpret or compare PND values estimated from cases with different baseline phase lengths.

Percentage of all non-overlapping data (PAND)

For an outcome where increase (decrease) is desirable, Parker et al. (2011a) defined PAND as the proportion of observations remaining after removing the fewest possible number of observations from either phase so that the highest remaining point from the baseline phase is less than the lowest remaining point from the treatment phase (lowest remaining point from the baseline phase is larger than the highest remaining point from the treatment phase).

This effect size does not have a stable parameter definition because its magnitude depends on the number of observations in each phase (Pustejovsky, 2018a).

Adapted from R package ‘SingleCaseES’ effect size definitions (Pustejovsky & Swan, 2018).

Percent exceeding the median (PEM)

Ma (2006) proposed the percent exceeding the median, defined as the proportion of observations in phase B that improve upon the median of phase A. Ma (2006) did not specify an effect size parameter corresponding to this index.

Non-overlap of all pairs (NAP)

Parker & Vannest (2009) proposed non-overlap of all pairs (NAP) as an effect size index for use in single-case research. NAP is defined in terms of all pair-wise comparisons between the data points in two different phases for a given case (i.e., a treatment phase versus a baseline phase). For an outcome that is desirable to increase, NAP is the proportion of all such pair-wise comparisons where the treatment phase observation exceeds the baseline phase observation, with pairs that are exactly tied getting a weight of 1/2. NAP is exactly equivalent to the modified Common Language Effect Size (Vargha & Delaney, 2000) and has been proposed as an effect size index in other contexts too (e.g., Acion, Peterson, Temple, & Arndt, 2006).

NAP can be interpreted as an estimate of the probability that a randomly selected observation from the B phase improves upon a randomly selected observation from the A phase.

Improvement rate difference (IRD)

The robust improvement rate difference is defined as the robust phi coefficient corresponding to a certain 2×22×2 table that is a function of the degree of overlap between the observations each phase (Parker et al., 2011a).

This effect size does not have a stable parameter definition because its magnitude depends on the number of observations in each phase (Pustejovsky, 2018a).

Tau / Tau-U

Tau and Tau-U are related effect sizes proposed by Parker et al. (2011b) and known collectively as "Tau-U." The basic estimator **Tau** does not make any adjustments for time trends. The **Tau-U** variant is similar to Tau, but includes an adjustment for baseline time trends. For an outcome where increase is desirable, the index is calculated as Kendall's SS statistic for the comparison

Adapted from R package 'SingleCaseES' effect size definitions (Pustejovsky & Swan, 2018).

between the phase B data and the phase A data, plus Kendall's SS statistic for the A phase observations, scaled by the product of the number of observations in each phase.

This effect size does not have a stable parameter definition (Tarlow, 2017).

PARAMETRIC EFFECT SIZES

Within-case standardised mean difference (SMD)

Gingerich (1984) and Busk & Serlin (1992) proposed a within-case standardized mean difference for use in single-case designs (within-case because it is based on the data for a single individual, rather than across individuals). The standardized mean difference parameter is defined as the difference in means between phase B and phase A, scaled (i.e. divided) by the standard deviation of the outcome within phase A.

Note that SD of phase A represents *within-individual* variability only. In contrast, the SMD applied to a between-groups design involves scaling by a measure of between- and within-individual variability. Thus, the scale of the within-case SMD is *not* comparable to the scale of the SMD from a between-groups design.

Log-response ratio (LRR)

The log-response ratio (LRR) is an effect size index that quantifies the change from phase A to phase B in proportionate terms. Pustejovsky (2015) proposed to use it as an effect size index for single-case designs (see also Pustejovsky, 2018b). The LRR is appropriate for use with outcomes on a ratio scale—that is, where zero indicates the total absence of the outcome.

Log-odds ratio (LOR)

The log-odds ratio is an effect size index that quantifies the change from phase A to phase B in terms of proportionate change in the odds that a behavior is occurring (Pustejovsky, 2015). It is appropriate for use with outcomes on a percentage or proportion scale. The log odds ratio ranges from −∞−∞ to ∞∞, with a value of zero corresponding to no change in mean levels.

Adapted from R package 'SingleCaseES' effect size definitions (Pustejovsky & Swan, 2018).