Dynamic Assessment Treatment Algorithm (DATA)

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(1) **Raw Factor Score** =

$$\left[(\%\, CFA\ Variance) \times \frac{(Autoregression^2 + \sum Cross - Predictions^2)}{N_{Factors}}\right]$$

This calculation returns a score for each factor that is a function of the percent variance in the total symptom variation, accounted for *by that factor* within time and across time. The former is the percent variance from the confirmatory factor model and the latter is the percent variance in the predictive (i.e. time-lagged regression) portion of the dynamic model.

Both of these steps are facilitated by utilizing a standardized scale – where all model coefficients are on a -1 to 1, Pearson's *r* scale. Under these conditions, every factor has a standardized total variance of 1. Thus, for the within-time datum, the percent variance in the overall symptom variation is simply the sum of squared factor loadings for each factor, divided by the number of factors. Meanwhile, the time-lagged regression paths represent the square root of the percent variance predicted in the time-forward variable. This is the relationship between r and r^2 that bivariate linear regression users will be aware of. Thus, the sum of the squared values of *all predictive paths* from a given factor at time (t-1) to all other factors at time (t), divided by the number of factors, will yield the percent of predictive variance in the dynamic model accounted for by each factor. At minimum this will include the autoregression, and can include up to N-1 additional cross-predictions in the dynamic model (where N = number of factors).

(2) **Normalized Factor Score (FS_N)** = $\frac{Raw\ Factor\ Score}{Max\ Factor\ Score}$

This sets the scale for all Factor Scores between 0 and 1, with a fixed maximum of 1.

(3) **Raw Item Score** = $\frac{Item\ Mean}{Max\ Mean} \times FS_N \times$ |Standardized Factor Loading|

The item mean reflects the average level of severity (on a 0 to 100 visual analog slider) indicated by the respondent on a given symptom item. Again, dividing by the maximum mean across items normalizes the mean scale between 0 and 1, with a fixed maximum of 1. Thus, for each item we are generating a score that is a function of (a) the average symptom severity, relative to other symptoms; (b) the relative explanatory power – within and across time – for the factor the symptom corresponds to; and (c) the degree to which the symptom relates to the factor.

For cross-loadings (items loading on multiple factors), the calculation is augmented to:

$$\frac{Item\ Mean}{Max\ Mean} \times \sum(FS_N \times |\text{Standardized Factor Loading}|)$$

(4) **Normalized Item Score (IS_N)** = $\frac{Raw\ Item\ Score}{Max\ Item\ Score}$

This step normalizes Item Scores between 0 and 1, with a fixed maximum of 1.

(5) **Module Score**

(5a) **Item-Average Module Score** = $\frac{\sum IS_N}{N_{Items}}$

(5b) **Raw Sum Module Score** = $\sum IS_N$

(5c) **Final Module Score** = $\frac{Normalized\ (\frac{\sum IS_N}{N_{Items}}) + Normalized\ (\sum IS_N)}{2}$

The raw sum preferentially weights those modules with a greater number of items. The assumption here is that a module with a greater number of treatment targets will address a wider range of psychopathology. However, more narrowly defined interventions – such as exposure – might be penalized for being relatively underrepresented in the matching matrix. Thus, the average of the item scores within each module reflects the central tendency of the module, without penalizing modules with fewer items. Taking the average of the (normalized) item-average and raw sum thus provides a balance between a more overtly model-oriented or item-oriented scoring system.

The N invoked in the item-average calculation is *not* the total possible number of items in the module. Instead the average is taken over the number of module items present in the model. Items from the total symptom set are often removed during earlier factor analytic steps.