

Supplemental Materials

Spontaneous thought separates into clusters of negative, positive, and flexible thinking

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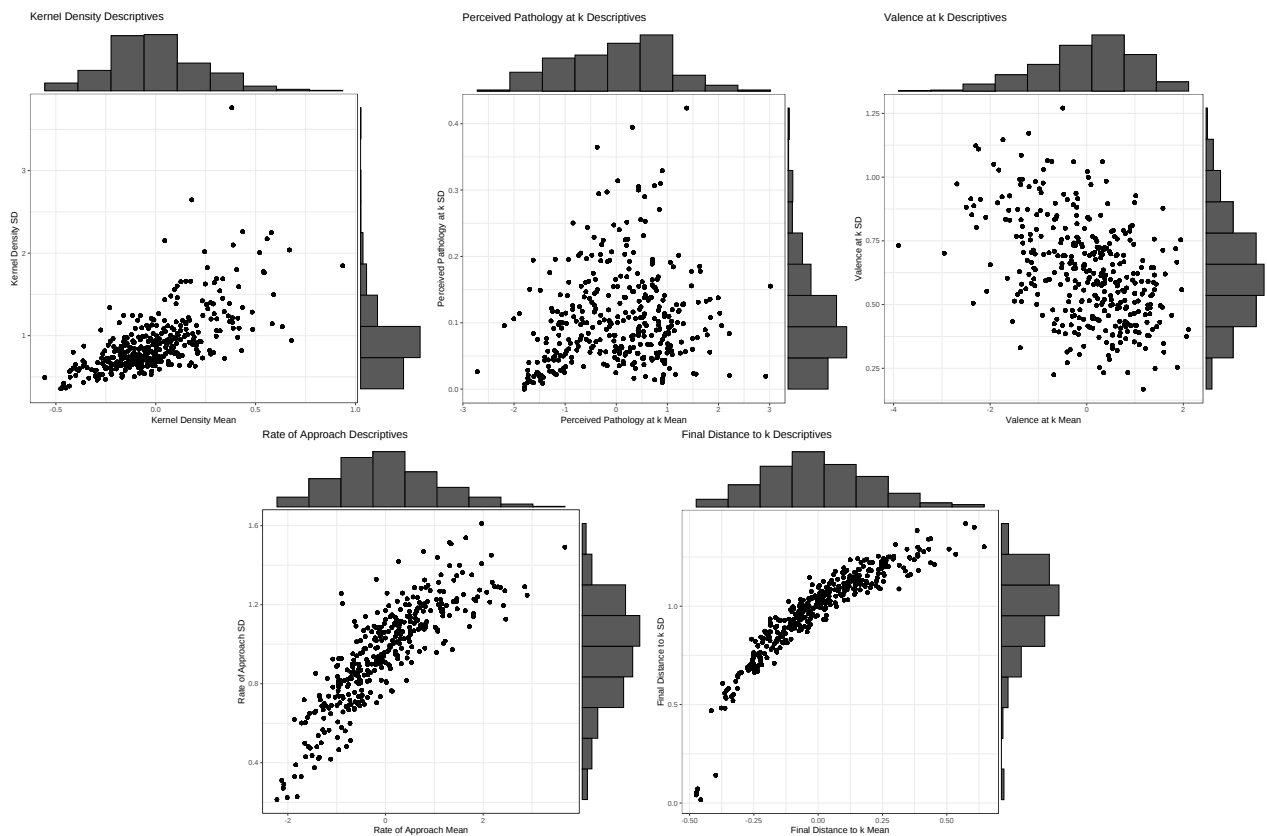
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Parameter Descriptives

Because participants completed 21 word-chains, 21 distinct $\hat{k}$ s and rates of approach (μ) were estimated for each participant. Each $\hat{k}$ also yielded a distinct associated valence, “perceived overthinking” rating, and kernel density. Trial-based parameter estimations varied within participants, meaning that individual thinking behaviors often varied throughout the completion of the task. While primary analyses utilized all trial-based data, supplemental analyses below explored individual-level parameters averages and their relationship to clinical self-report measures of stress, rumination, worry, and mood. See *Supplemental Figure 1* for a visual representation of all five primary variables of interest: 1. Rate of approach, 2. Valence at $\hat{k}$, 3. Perceived overthinking ratings at $\hat{k}$, 4. Kernel density estimates at $\hat{k}$, and 5. Final distances to $\hat{k}$.



Supplemental Figure 1: Individual-level Parameter Descriptives. Visual representation of means (x-axes) and standard deviations (SD; y-axes) of relevant variables. Both frequency histograms and scatter plots are displayed.

Individual-Level Analyses

Multiple Linear Regression

Collapsing across all 3 samples, we carried out several multiple linear regression models. Note that for this model, we computed individual averages for each participant across all 21 of their trials. This model included three predictors (our cluster variables): final distance to $\hat{k}$, valence at $\hat{k}$, and rate of approach. This model tried to predict self-report measures of stress (PSS), negative mood (PANAS negative), and stuck thought (RRS).

$$RRS \sim \mu + \hat{k}_{final\ distance} + \hat{k}_{valence}$$

$$PSS \sim \mu + \hat{k}_{final\ distance} + \hat{k}_{valence}$$

$$PANAS_{negative} \sim \mu + \hat{k}_{final\ distance} + \hat{k}_{valence}$$

Our results revealed a trend-level significant prediction of rumination (as measured by RRS; $F(362) = 2.14, p = 0.09$), and significant prediction of stress, (as measured by PSS; $F(362) = 4.39, p < 0.01$), and negative mood (as measured by PANAS; $F(362) = 7.98, p < 0.001$). This finding highlights that increased negative valence at $\hat{k}$, larger rate of approach, and larger final distance to $\hat{k}$ predict elevated self-report measures of rumination, stress, and negative mood.

We also considered the possibility that there may be a non-linear relationship between our model-derived measures and our self-reports. Accordingly, we conducted 3 generalized additive models (GAMs). Results suggested that a non-linear model did not significantly predict RRS better than a null model ($\chi^2 = 6.7, p = 0.10$), but it did predict PSS ($\chi^2 = 21.8, p < 0.01$) and PANAS negative ($\chi^2 = 22.7, p < 0.001$) better than null models. However, both of these GAMs did not yield smaller BICs

($BIC_{difference (linear-GAM)} = -10.8 - 0.0$) than our multiple linear regression models, indicating that the relationship between our model-estimated variables and our self-report measures was likely linear.

Mixed-Linear Model

Collapsing across all 3 samples, we conducted a mixed-linear model aimed to investigate whether individual clustering patterns (meaning, cluster membership during all 21 trials) predicted self-reported RNT, stress, and negative mood. No model significantly predicted these self-reported measures (RRS: $F(5837) = 0.16, p = 0.92$, PSWQ: $F(5837) = 0.40, p = 0.75$, PSS: $F(5837) = 2.42, p = 0.06$, PANAS: $F(5837) = 1.57, p = 0.19$).

Canonical Correlation Analysis

In a final attempt to understand how patterns of clustering within individuals may have predicted self-report measures of RNT, stress, and negative mood, we conducted a canonical correlation in Sample 3 ($N = 222$). In canonical correlation analyses, there is no set r -coefficient cut-off that constitutes a “good” or “viable” coefficient. However, values closer to 1 are considered stronger and have greater predictive power. The largest r -coefficient that we obtained was 0.25 ($p < 0.001$), only explaining 6.25% of the variance in our data, indicating a weak predictive power. Accordingly, we concluded that no clustering patterns were uniquely predictive of self-reported psychopathology severity, as those may be better explained by data likely not captured in our model/task.