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### **Fractal Response Time Distributions using the MS-50: A Replication and Extension**

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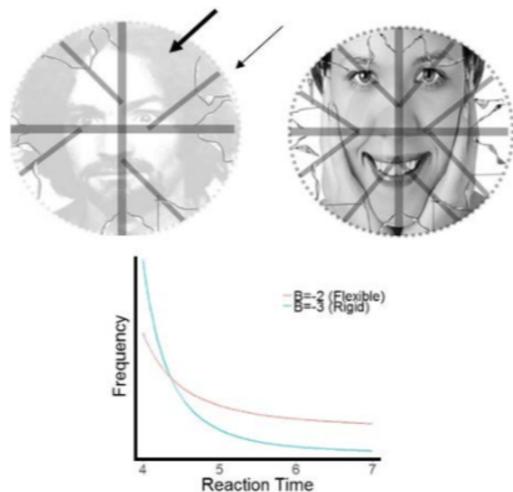


## Introduction

Pincus et al. (2019) found that self-complexity could be measured based on the distribution of reaction-times to the 567 items of the MMPI-2. The study found that reaction-times for a forensic sample of adults (mean age = 33) could be modeled as an inverse power-law (IPL). This suggests that personality trait networks are fractal. Next, they showed that rigidity in that fractal trait structure was associated with psychopathology. The current study is a replication and extension of Pincus et al. (2019) using a college sample and the M5-50 (“Big Five”) personality measure.

**Hypothesis 1:** Reaction-time distributions will generally conform to IPL distributions.

**Hypothesis 2:** A steeper shape parameter ( $\beta$ ) will be correlated with psychopathology (e.g., anxiety, depression, and obsessive-compulsive symptoms) and M5-50 trait scores (e.g., Openness, Extraversion, Neuroticism, Agreeableness and Conscientiousness).



## Method

Seventy undergraduate college students volunteered to complete the M5-50 personality test as part of a larger study of anxiety. The test was administered online through Qualtrics for undergraduate psychology course credit and reaction times (RTs) to each question were recorded automatically. RTs were rounded to the nearest integer, and values < 1 sec. or > 25 sec. were removed to improve validity. One participant was removed for incomplete responding leaving N = 69. Values below the mode in each participant’s distribution were added to the mode to allow for IPL fit analyses. Regression analyses were run in SPSS to obtain  $R^2$  (IPL fit) and  $|\beta|$  values (rigidity).

## Results and Discussion

$R^2$  values and  $|\beta|$  values (rigidity), provide general support for Hypothesis 1.

### Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
R-squared	69	.57	1.00	.8806	.09313
Rigidity	69	.79	6.41	2.6530	1.14408
Valid N (listwise)	69				

Significant correlations were found between rigidity ( $\beta$ ) and: worry (PSWQ), GAD (GAD-7), and Openness (via the M5-50) provide some support for Hypothesis two. However, the pattern of correlations were consistently in the opposite direction.

### Correlations

		Rigidity	R-squared	GAD	Worry: PSWQ	Openness scale
Rigidity	Pearson Correlation	1	.576**	-.249*	-.289*	.252*
	Sig. (2-tailed)		.000	.042	.018	.040
	N	69	69	67	67	67
R-squared	Pearson Correlation	.576**	1	-.056	-.131	.178
	Sig. (2-tailed)	.000		.653	.290	.149
	N	69	69	67	67	67
GAD	Pearson Correlation	-.249*	-.056	1	.691**	.038
	Sig. (2-tailed)	.042	.653		.000	.761
	N	67	67	69	69	68
Worry: PSWQ	Pearson Correlation	-.289*	-.131	.691**	1	.050
	Sig. (2-tailed)	.018	.290	.000		.688
	N	67	67	69	69	68
Openness scale	Pearson Correlation	.252*	.178	.038	.050	1
	Sig. (2-tailed)	.040	.149	.761	.688	
	N	67	67	68	68	69

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

## Results and Discussion

Correlations between all three DASS scales, obsessions ( $r = -0.209$ ) and compulsions ( $r = -0.065$ ), extraversion ( $r = 0.154$ ), conscientiousness ( $r = -0.029$ ), agreeableness ( $r = 0.171$ ), neuroticism ( $r = -0.123$ ), and major depressive disorder symptoms (MDD) ( $r = -0.181$ ) were all in a consistent direction (with rigidity predicting healthier functioning) but were not statistically significant. However, more data has been collected (N = 454), and one may expect that some correlations (i.e.,  $r > .15$ ) will be significant with this larger N.

There are several possibilities why correlations from this study were the opposite of Pincus et al. (2019). First, this study uses a very different sample (forensic adult with mean age = 33 versus typical undergraduates). It is possible that “rigid” in this sample is more akin to “simple” – leading to less anxiety within a relatively positive life circumstance. Second, the M5-50 is a measure of universal, central personality traits; while the MMPI-2 measures a great variety of personality features and is focused on psychopathology. It is possible that “rigidity” in the current study is more like self-concept clarity, which is functional. Third, it is possible that moderate flexibility (between rigid and flexible) is the most resilient trait structure. In this case, the healthiest individuals would lie between rigid and flexible in their  $\beta$  values. Each of these possibilities will be explored in the larger (N = 454) data set, or through follow-up studies using different samples (undergraduate and clinical) and both the MMPI-2 and M5-50.

## References

Pincus, D., Cadsky, O., Berardi, V., Asuncion, C. M., & Wann, K. (2019). Fractal Self-Structure and Psychological Resilience. *Nonlinear Dynamics, Psychology, and Life Sciences*, 23(1).