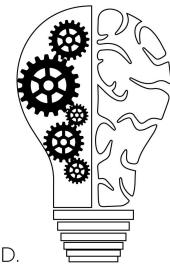


## Episode 095: The Big Five: Neuroticism Part 2

Alec Zane B.A., Alexis Carnduff B.S., David Puder M.D.

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There are no conflicts of interest for this episode.



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## Introduction

In part 1, we talked about how people high in neuroticism experience higher levels of psychological distress, including more anxiety, angry hostility, depression, self-consciousness, impulsiveness, lack of vulnerability, and marital dissatisfaction. We talked about how it can change over someone’s life, and although 60% is caused by their environment, there seem to be some candidate genes that are linked with neuroticism. We looked at how there are many psycho- and physiopathologies, like chronic fatigue syndrome, ulcers, and coronary heart disease, linked with neuroticism.

Today, in part 2, we talk about how medications, such as Selective Serotonin Reuptake Inhibitors (SSRIs), psychotherapy, and exercise can make an impact. Trial studies of mindfulness-based cognitive therapy and cognitive behavioral therapy (CBT) have shown promise in the treatment of neuroticism. We also discuss the possible *benefits* of neuroticism. Studies have shown that neurotic people may outperform their stable counterparts in a work context. This “healthy neuroticism” may exist when the effects of neuroticism and conscientiousness interact.

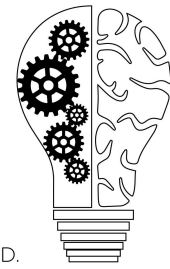
## Treatment of Neuroticism

### Neuroticism and psychopharmacology

- A randomized controlled trial examined whether neuroticism acts as a mediator of treatment response to SSRIs in Major Depressive Disorder (MDD) ([Quilty, Meusel, and Bagby, 2008](#)).
  - 62 men and 89 women were observed over a 16-week trial on an SSRI, NDM (dopaminergic reuptake blockers), or RIMA (reversible monoamine oxidase inhibitors)

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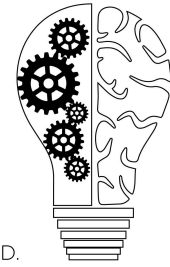
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- Mediation model produced goodness-of-fit indices above established cutoffs, Ham-D6:  $\chi^2=.31$ ,  $df=1$ ,  $pN.05$ , CFI=1.00, RMSEA=.00 (see Fig. 1a); BDI-II:  $\chi^2=.47$ ,  $df= 1$ ,  $pN.05$ , CFI= 1.00, RMSEA=.00 (see Fig. 1b).
  - Suggests that any treatment effect of SSRIs occurred through neuroticism reduction
  - Patients who received SSRIs exhibited greater reduction in neuroticism than those receiving NDM/RIMAs, and this neuroticism reduction was associated with greater depressive symptom shift
- This article discusses, consistent with previous research, that *decreases* in depressive symptoms during treatment *co-occur* with reduction in neuroticism, but also demonstrates that changes in neuroticism are not completely accounted for with changes in depression.
- Another study suggests the outcome and treatment of depression may be worsened by higher levels of neuroticism ([Hayward, Taylor, Smoski, et al., 2013](#))
  - Participants were enrolled in Neurocognitive Outcomes of Depression in the Elderly (NCODE) between December 1994 and June 2000.
    - Personality as a retrospective measure in this study. Completed the NEO PI-R after treatment began
    - Participants were assessed using the Montgomery–Åsberg Depression Rating Scale (MADRS) to measure severity of patients’ diagnosed depression
    - “Depending on when each participant entered the study and when they completed the NEO PI-R, depression data predates personality assessment by between 0 and 62 months (mean = 19, SD = 15). Thus, personality is treated as a retrospective measure in this study, and is used in the analysis of depression severity data collected earlier” (Hayward, Taylor, Smoski, et al., 2013)
  - Depression severity at intake and after 3 and 12 months of treatment
  - Greater N was significantly related to greater likelihood (OR= 1.14,  $p<.05$ ) of being depressed at the domain level and on each of its facets
    - Association with depression regardless of the age of onset
  - E was related to less likelihood of depression as well as facets of assertiveness, activity, and positive emotions
  - C was related as a domain to reduce likelihood of being depressed

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- No personality factors were found to distinguish between early and late onset among depressed patients
- Greater depression severity after 3 months was associated with neuroticism (facets of depressiveness and stress-vulnerability)
- Lower depression severity after 3 months with extraversion (warmth) and conscientiousness (competence)

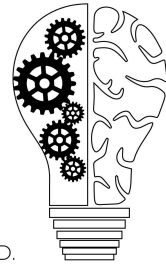
TABLE 2. Binary logistic regression results for personality factors and facets on depression status

	Depression Status <sup>a</sup>		
	OR	95% CI <sup>b</sup>	<i>p</i> <sup>b</sup>
<b>Neuroticism (N)</b>	1.14	(1.07 to 1.21)	< .001
Anxiety (N1)	1.11	(1.06 to 1.17)	< .001
Hostility (N2)	1.07	(1.02 to 1.13)	< .001
Depressiveness (N3)	1.16	(1.08 to 1.23)	< .001
Self-Consciousness (N4)	1.06	(1.01 to 1.10)	.007
Impulsivity (N5)	1.11	(1.05 to 1.17)	< .001
Stress-Vulnerability (N6)	1.12	(1.06 to 1.18)	< .001
<b>Extraversion (E)</b>	0.95	(0.90 to 0.99)	.002
Warmth (E1)	0.96	(0.91 to 1.00)	.068
Gregariousness (E2)	1.00	(0.96 to 1.04)	.999
Assertiveness (E3)	0.95	(0.91 to 0.99)	.048
Activity (E4)	0.93	(0.88 to 0.98)	< .001
Excitement-Seeking (E5)	1.03	(0.97 to 1.08)	.937
Positive Emotions (E6)	0.95	(0.91 to 0.99)	.003
<b>Openness (O)</b>	0.98	(0.94 to 1.03)	.972
Fantasy (O1)	1.00	(0.95 to 1.06)	.999
Aesthetics (O2)	0.99	(0.95 to 1.03)	.999
Feelings (O3)	1.00	(0.96 to 1.04)	.999
Actions (O4)	0.98	(0.94 to 1.02)	.926
Ideas (O5)	0.97	(0.92 to 1.02)	.497
Values (O6)	0.99	(0.95 to 1.04)	.999
<b>Agreeableness (A)</b>	0.98	(0.93 to 1.03)	.958

- Discussion
  - Dimensions of personality were associated with presence and severity of depression following treatment in older adults. Neuroticism was

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associated with the presence of depression and with outcomes after treatment among the depressed. N was higher among depressed patients vs comparison subjects, and was associated with more severe depression after 3 and 12 months of treatment.

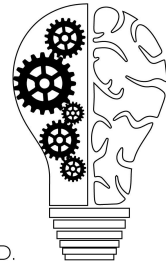
- Neuroticism remains an important factor in depression.
- Personality was unrelated to baseline depression severity but related on several dimensions to post-treatment depression severity.
  - Suggests that personality may affect a patient's overall risk for a disorder, as well as response to a treatment
    - Facets of depressiveness (N3) and stress vulnerability (N6) appear to play the biggest role and predict worse outcomes during an episode of major depression
- ***Our criticisms of this study***
  - This study does not take into consideration the treatability of neuroticism and how dynamic it tends to be throughout the lifetime by allowing a number of participants to be given the NEO before treatment began. By failing to take these factors into account, the data they found may be misleading. The authors go on to say that neuroticism is stable throughout all stages of life. However, we would disagree on this statement based on the studies discussed in Neuroticism Part 1.

## Psychotherapy

- Studies have shown that personality traits have an effect on therapy outcomes. In particular, neuroticism has been associated with less favorable outcomes in both interpretive and supportive short-term group psychotherapy ([Ogrodniczuk, Piper, Joyce, et al. 2003](#))
  - Study of psychiatric outpatients with complicated grief who either completed interpretive or supportive short-term group therapy
  - Personality variables were assessed prior to treatment with the NEO-FFI
  - Treatment outcomes and post-therapy status were gathered through questionnaires
  - Neuroticism was found to be associated with less favorable outcomes ( $F_{\text{change}} = 5.05$ ,  $df = 1,90$ ,  $p = .027$ ) in grief symptoms, interpersonal distress, psychiatric symptoms, etc
  - Results showed that extraversion ( $F_{\text{change}} = 10.26$ ,  $df = 1,90$ ,  $p = .002$ ), conscientiousness ( $F_{\text{change}} = 5.73$ ,  $df = 1,100$ ,  $p = .019$ ), and openness

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( $F_{\text{change}} = 3.88$ ,  $df = 1,100$ ,  $p = .05$ ) were directly associated with favorable treatment outcome

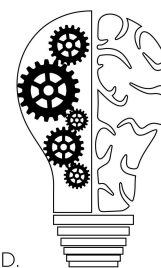
- No significant interaction between patient personality and form of therapy found
- Authors suggest that “it is unlikely that the chronic, generalized distress of patients high on neuroticism is amenable to short-term psychotherapy” (Ogrodniczuk, Piper, Joyce, et al, 2003)

It’s hard to tell how strong the links are from this study in particular. It would have been helpful if they did the NEO at the end to see how much the neuroticism changed with treatment. It’s possible that the people who showed high neuroticism had worse symptoms. In the above SSRI study, there seems to be a close tie between neuroticism and depression. Were the people with less favorable outcomes more severely ill? This matters because those who are severely ill will require more treatment.

- Pilot randomized controlled trial of efficacy of Mindfulness-Based Cognitive Therapy (MBCT) vs online self-help intervention in highly neurotic individuals ([Armstrong and Rimes, 2016](#))
  - Mindfulness defined by awareness and acceptance of ongoing emotional experience, a potential protective factor against neuroticism. MBCT teaches “skills to help people notice thoughts, feelings, and bodily sensations while cultivating an accepting, curious, and nonjudgmental attitude”.
    - Practicing mindfulness may help prevent perseverative negative thinking, resulting in decreased emotional sensitivity in neurotic patients.
  - Hypothesized the MBCT patients would report significantly lower post treatment levels of neuroticism, anxiety, depression and significantly higher post treatment levels of mindfulness, self-compassion, and decentering
    - Neuroticism was measured with the Eysenck Personality Questionnaire, administered throughout the treatment
      - Score of 6 or higher required to be a participant in study
  - It’s important to note is what they practiced concurrently with the MBCT; patients also participated in eight 2-hour sessions addressing psychological processes important to neuroticism, including:
    - Stress reactivity
    - Interpretation biases

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- Stress sensitivity
  - Avoidance and safety-seeking behaviors
  - Added suffering
  - Overthinking
  - Self-criticism
  - Stress vulnerability relapse prevention
  - Weekly homework on these trainings
- Results showed that the MBCT group had lower levels of neuroticism vs the control group at 4 weeks post treatment ( $\eta^2 = .248, p < .01$ ). MBCT group also experienced significant reductions in rumination ( $\eta^2 = 0.173, p < .05$ ) and increases in self compassion ( $\eta^2 = .324, p < .01$ ) and decentering ( $\eta^2 = 0.217, p < .01$ ).
- MBCT supported as an effective treatment for reduction in neuroticism

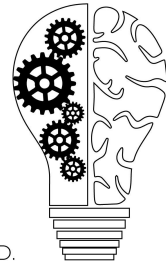
Table 2

*Means and standard deviations of all clinical and process measures, and results of all ANCOVAs*

Analysis/Measure	MBCT <i>M (SD)</i> ( <i>n</i> = 17)		Self-help <i>M (SD)</i> ( <i>n</i> = 17)		Group Difference at post-treatment, covarying for baseline scores		
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	<i>F</i>	<i>p</i>	Partial $\eta^2$
<i>Clinical Outcomes</i>							
Neuroticism	8.5 (1.8)	4.5 (3.1)	10.2 (2.0)	9.2 (2.9)	10.25	0.003	0.248
Functional impairment	18.2 (7.6)	11.4 (10.4)	20.9 (7.8)	18.2 (8.8)	3.16	0.085	0.093
Anxiety	7.3 (4.5)	4.1 (4.4)	11.1 (4.1)	8.1 (4.9)	0.97	0.332	0.030
Depression	6.6 (5.6)	6.1 (5.6)	11.1 (4.9)	8.8 (4.28)	0.04	0.840	0.001
<i>Process Measures</i>							
Mindfulness	107.8 (13.4)	132.8 (25.0)	102.2 (17.1)	116.0 (20.5)	3.27	0.080	0.095
Rumination	40.3 (7.0)	28.2 (11.9)	39.9 (4.2)	35.5 (7.3)	6.50	0.016	0.173
Beliefs about emotions	44.4 (12.6)	29.8 (18.2)	48.8 (13.0)	41.3 (11.9)	4.06	0.053	0.116
Self-compassion	27.2 (7.0)	40.7 (9.1)	23.1 (2.8)	27.9 (6.3)	14.83	0.001	0.324
Decentering	28.4 (4.6)	39.2 (10.2)	25.9 (2.5)	29.7 (5.2)	8.58	0.006	0.217

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- More recent study also shows improvement of mindfulness skills and long-term reductions of neuroticism with MBCT ([Spinhoven, Hujibers, Ormel, et al., 2017](#))
  - Two randomized controlled trials where patients with recurrent depression in remission were treated with MBCT. Mindfulness skills and personality traits were measured at baseline, after treatment, and at a 15-month follow-up.
  - Control group was only given maintenance antidepressant medication
    - Personality traits were measured with the NEO PI-R, and mindfulness with the Five Facet Mindfulness Questionnaire
  - Results showed significantly lower levels of neuroticism ( $d = .54, p < .001$ ) and higher levels of conscientiousness ( $d = .35, p < .01$ ) at 15-month follow-up. MBCT patients also had significant improvement of mindfulness skills as measured by the FFMQ

NEO PI-R	Pre-treatment		15-month follow-up		<i>r</i>	<i>t</i>		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		(137)	<i>p</i>	<i>d</i>
Neuroticism	151.37	20.54	145.93	21.12	.77	4.50	<.001	.54
Extraversion	140.33	18.15	142.38	18.04	.81	2.15	.03	.25
Conscientiousness	153.50	18.11	156.25	19.45	.82	2.83	<.01	.35
Agreeableness	173.22	16.24	171.99	15.37	.82	1.54	.12	.19
Openness to experience	156.75	15.87	157.39	15.27	.81	.78	.43	.09

Note. NEO-PI-R=NEO Personality Inventory Revised;  $p_1 = .01$  (.05/5);  
 $d$ =Cohen's  $d$  for repeated measurements

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Variable	Pre-treatment		Post-treatment		<i>r</i>	<i>t</i> (137)	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
FFMQ Tot	117.63	16.01	128.41	16.87	.53	7.98	<.001	.95
FFMQ Obs	24.60	4.84	26.76	4.84	.48	5.34	<.001	.63
FFMQ Des	25.78	5.88	27.09	5.77	.78	3.97	<.001	.47
FFMQ Act	22.62	5.26	24.96	4.97	.45	5.11	<.001	.62
FFMQ Nju	25.78	6.20	28.17	6.13	.63	5.25	<.001	.64
FFMQ Nre	18.85	4.21	21.43	3.80	.25	6.18	<.001	.74

Note. FFMQ=Five Facet Mindfulness Questionnaire; NEO-PI-R=NEO Personality Inventory Revised; Obs=Observing; Des=Describing; Act=Acting with awareness; Nju=Non-judging; Nre=Non-reactivity;  $p_1=.01$  (.05/5);  $d$ =Cohen's  $d$  for repeated measurements

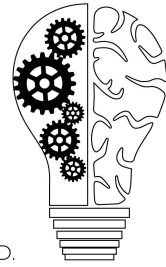
- Group cognitive behavioral therapy has been shown to significantly reduce neuroticism in patients with social anxiety disorder ([Glinski, Page, 2010](#))
  - Study looked to see if the degree of personality pathology among patients with social anxiety disorder was correlated with neuroticism and extraversion. Also looked to see if scores in neuroticism personality dimensions improved after treatment
  - Within-subjects repeated measures design that had patients attend a program that addressed the cognitive model of social anxiety and the role of thinking. Patients taught to monitor and challenge their unhelpful thinking to reduce anxiety.
  - NEO-PI-R, Fear of Negative Evaluation scale, Social Phobia Scale, and the Social Interaction Anxiety Scale were administered before and after treatment



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- Results showed significant improvements in social anxiety disorder symptoms ( $F(1,20) = 71.02, p < .001$ ), reductions in neuroticism ( $F(1,22) = 35.75, p < .001$ ), and increases in extraversion ( $F(1,22) = 19.02, p < .001$ )
- Neuroticism ( $\beta = .46$ ) and agreeableness ( $\beta = -.43$ ) emerged as significant predictors of pathology



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## Exercise

There aren't specific studies analyzing neuroticism and exercise, but there are many that look at how exercise could reduce depression, which is associated with neuroticism.

- In two large studies, the combination of aerobic and strength training had the lowest likelihood of developing depressive symptoms ([Bennie, 2019](#)) ([Ofstedal 2019](#))
- In a prospective study on MDD, aerobic/strength training showed improved treatment response over lower-intensity exercise ([Moraes, 2019](#))
- Further, when trying to increase brain-derived neurotrophic factor (BDNF), which is like Miracle Grow for the brain, strength training with aerobic exercise was effective, whereas mild to moderate aerobic exercise was not ([Marinus, 2019](#))

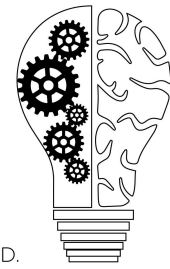
In summary, aerobics and strength training show synergy, and the best practice for someone with higher neuroticism is to do consistent exercise (the study recommends at least thirty minutes of exercise, several times per week).

## Possible benefits of neuroticism

- Good wartime leaders like Winston Churchill might have been neurotic
- Field study that found that highly neurotic individuals outperformed their stable counterparts in a busy work environment or if expending a high level of effort ([Smillie, Yeo, et al., 2006](#))
  - Examined the interaction between office busyness and Eysenck Personality Inventory Neuroticism in prediction of telesale performance
    - Office busyness was operationalized as the total number of quotes issued within the whole office
    - Job performance was operationalized as number of individual sales made by an participant

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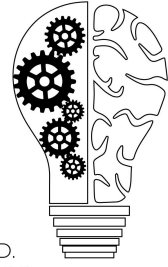
- Results showed that increases in office busyness were associated with greater performance improvements for highly neurotic individuals ( $\beta = .61$ ,  $t(57) = 7.34$ ,  $p < .001$ ) compared with less neurotic individuals ( $\beta = .36$ ,  $t(60) = 3.63$ ,  $p < .001$ ). Neuroticism was a significant moderator in the relationship between office sales and individual sales,  $t(57) = 2.46$ ,  $p < .05$
  - Highly neurotic individuals outperformed their stable counterparts in a busy environment and when they expended a high level of effort
  - “Our findings suggest that a global pessimistic view of neuroticism may not withstand close examination in a work context” (Smillie, Yeo, et al., 2006)
- 
- Study shows a curvilinear effect of state neuroticism on task performance when high-performing professionals were asked to complete a complex cognitive task ([Beckmann, Beckmann, Minbashian, et al., 2013](#))
    - Examined the relationship of neuroticism and performance when undertaking cognitive tasks
    - Previous research has shown a small effect (meta-analytic correlation coefficient =  $-.15$ ) between trait neuroticism and cognitive performance ([Ackerman and Heggstad, 1997](#))
    - Evaluated if neuroticism is nonlinearly related to cognitive performance. The Yerkes-Dodson law states that performance is an inverted U-function of arousal ([Yerkes and Dodson, 1908](#))
      - We tend to function best when we are at moderate levels of arousal

This is an interesting study because it looks at the nonlinear relationships. Most correlations are a linear relationship between two things, but this study is much more of a curve. Somewhere in the middle you reach peak performance. For instance, there may be some activities that are highly stimulating or fear-inducing for some people. It may be possible for certain people and jobs to benefit from a certain amount of neuroticism.

- Hypothesized that higher levels of state neuroticism would facilitate performance in a cognitive task, up to a certain level, with high levels of neuroticism being detrimental to task performance.
- Participants first were assessed with the IPIP NEO inventory. Several months later, they administered a cognitive test which employed the item paradigm used in the Analysis Synthesis Subtest of the Woodcock-Johnson Psychoeducational Battery-III.
- Hierarchical regression analyses revealed:

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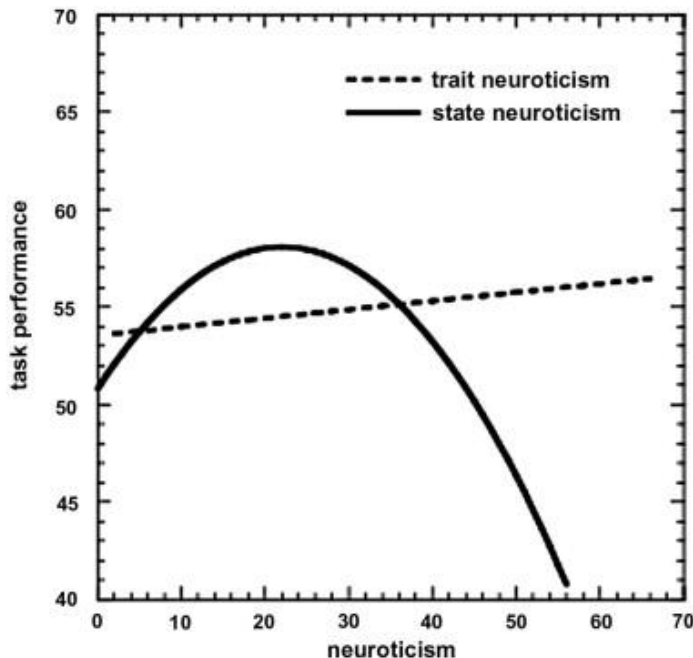
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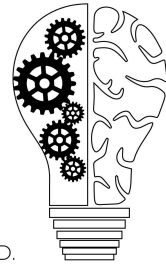
1. No linear effect of neuroticism on performance in the Analysis Synthesis Task (model 1:  $\beta = -.01$ ,  $t = -0.13$ ,  $p = .89$ ,  $\Delta R^2 = 0.0\%$ )
  2. The quadratic effect of state neuroticism on task performance was significant (Model 2:  $\beta = -.84$ ,  $t = -2.82$ ,  $p < .01$ ,  $\Delta R^2 = 6.6\%$ )
  3. No significant effects found for trait neuroticism
- The function of the state neuroticism-performance effect was inverted-U shaped. This suggests that moderate levels of neuroticism when doing a task are most conducive for performance



- Findings suggest a performance facilitation effect of neuroticism in some circumstances. Found that increases in state neuroticism had an optimizing effect on performance on tasks of moderate difficulty.
  - “Experiencing neurotics states does not necessarily have negative implications for performance. Can be advantageous to feel slightly neurotic when undertaking a complex cognitive task.”
- 
- Recent meta-analysis suggests that there may be a “healthy neuroticism” when the effects of neuroticism and conscientiousness interact, leading to a positive effect on health behaviors ([Graham, Weston, Turiano, et al., 2020](#))

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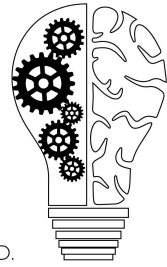
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- Although there seems to be a growing body of literature suggesting an association between high neuroticism and poor health outcomes, the existence of “healthy neuroticism” has been long debated
  - The degree to which the predictive effects of neuroticism are modified by conscientiousness
- Study aimed to test the moderating effect of conscientiousness on the neuroticism-health behavior association, specifically focusing on the behaviors of smoking, alcohol consumption, and physical activity
- Meta-analysis included 15 different longitudinal studies
  - “Healthy neuroticism” and smoking
    - The neuroticism by conscientiousness interaction was associated with odds of smoking. The average effect of the interaction was significant, but the association of neuroticism and odds of smoking appear to be lessened at the higher degree of conscientiousness (beta =  $-0.04$ , OR = 0.97, 95% CI = [0.94,0.99],  $p = .002$ )
    - Interaction was less pronounced with increasing age group, effect primarily present among younger adults

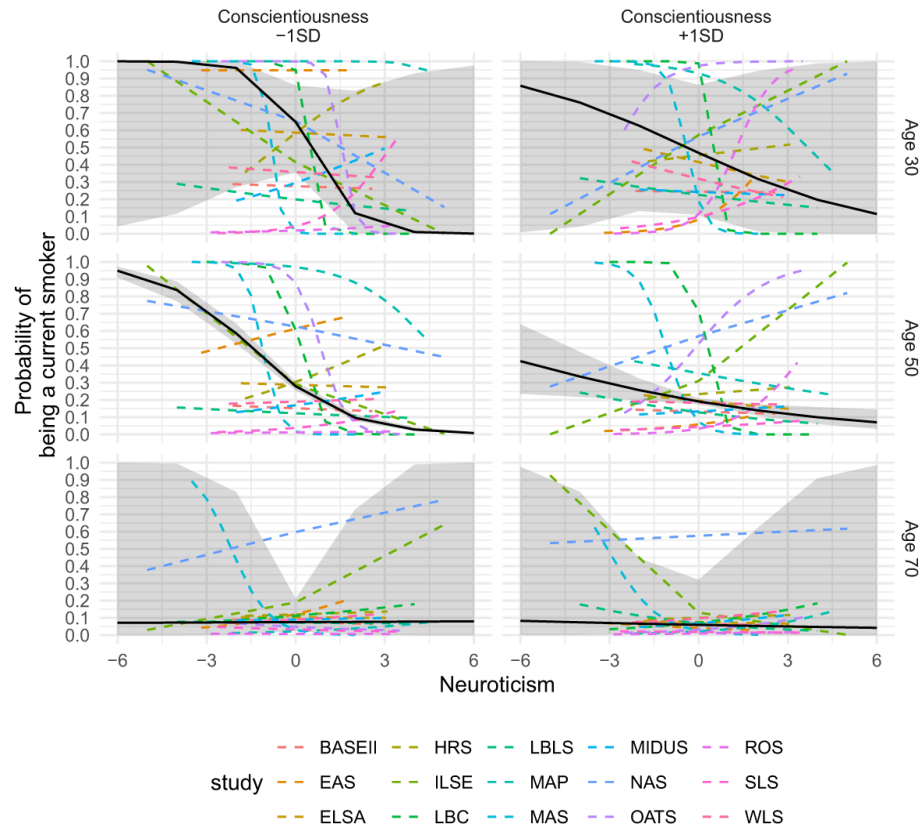
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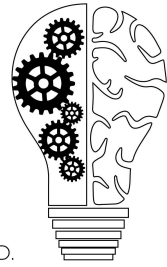
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- Healthy neuroticism and alcohol consumption
  - Neuroticism by conscientiousness interaction was not found to be significantly associated with odds of alcohol consumption ( $\beta = 0.01$ ,  $OR = 1.0$ ,  $95\% CI = [0.95, 1.08]$ ,  $p = .677$ )

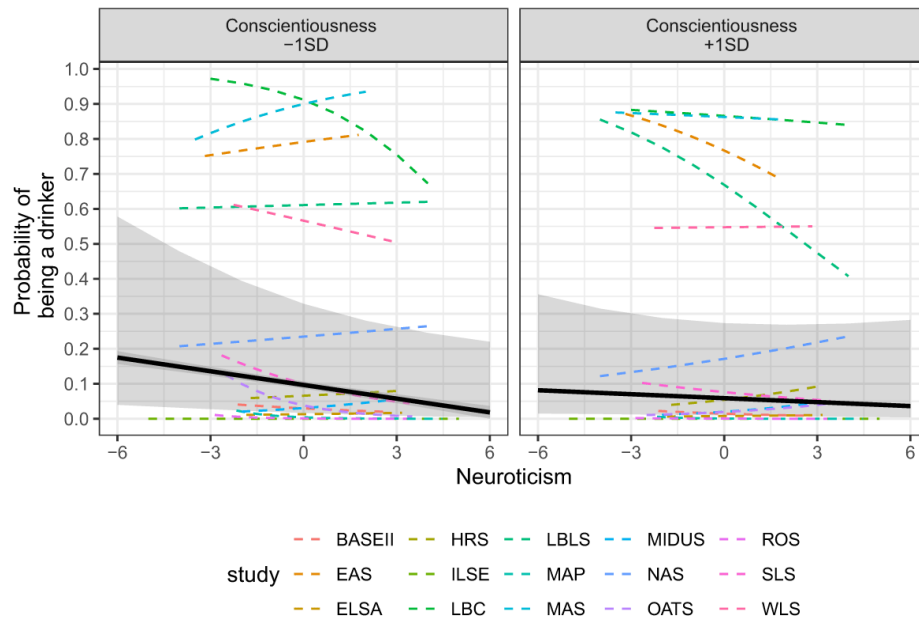
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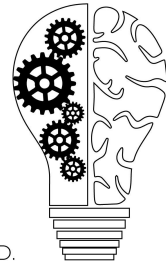
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- “Healthy neuroticism” and physical activity
  - Neuroticism by conscientiousness interaction was found to be associated with odds of physical activity ( $\beta = 0.04$ ,  $OR = 1.04$ ,  $95\% CI = [1.01, 1.07]$ ,  $p = .003$ )

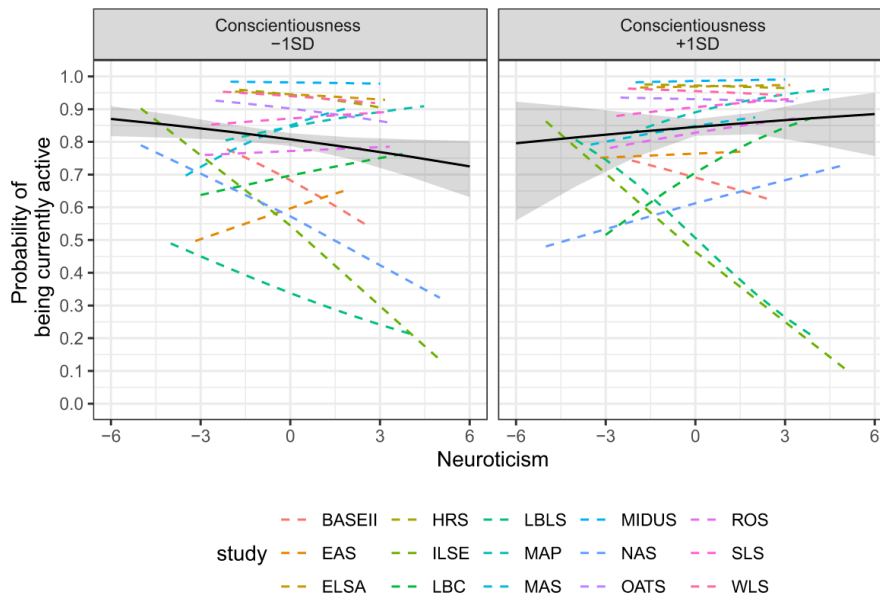
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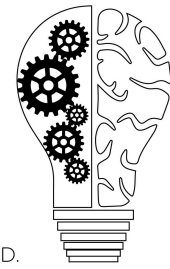
- Overall, results suggest that neuroticism alone was not related to health behaviors, and that other traits play a role. Neurotic people who are high in conscientiousness were found to be less likely to be smokers or drinkers, and more likely to engage in physical activity
- Supports the existence of a healthy “neuroticism” that is associated with positive health behaviors

### Top takeaway points:

1. Neuroticism shown to act as a mediator of treatment response to SSRIs in MDD
2. There have been several studies that show MBCT shows promise in decreasing neurotic symptoms. This plays into the idea that neuroticism isn't completely static and there are things we can do to actually help people.
3. Exercise has been shown to help people with depression and anxiety, which makes it possible to imagine it could help people who are neurotic. A combination of vigorous exercise and strength training are synergistic and seem to be helpful for pretty much every mental health issue.

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4. Studies have shown that neurotic people may outperform their stable counterparts in a work context.
5. Studies show a possible curvilinear effect of state neuroticism on task performance.
6. “Healthy neuroticism” may exist when the effects of neuroticism and conscientiousness interact.

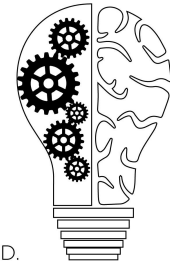
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