**Curiosity might not help after all:
Predicted trajectories for need for cognition
and anxiety and depression symptoms
based on findings by
Zainal and Newman (2022)**

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In a recent article in this journal, Zainal and Newman (2022) reported that need for cognition (NFC) predicted anxiety and depression symptoms (ADS) across 10 years in a large ($N = 6750$) sample of community-dwelling adults, and furthermore that a within-person decrease in NFC was associated with an increase in ADS. Here, we analyze the modelling approaches used in that paper, and show that the two different modelling strategies employed give contradictory results, suggesting that the results are influenced by statistical artifacts and should be interpreted with caution.

In a bivariate dual latent change score (BLCS) analysis, Zainal and Newman found a negative effect ($\delta = -0.892$) of change in NFC between two measurements (T1, T2), and change in ADS between two adjacent measurements (T2, T3). Likewise, they found a negative effect ($\delta = -0.509$) of change in ADS between two measurements and change in NFC between the two adjacent measurements. Partly based on these negative effects, Zainal and Newman concluded that measures to increase NFC may treat or prevent emergence of mental ill-health.

However, Zainal and Newman's own findings (see Figure 2 and Table 2 in their paper) show that predicted trajectories for NFC and ADS are more complicated than indicated just by the negative effects mentioned above. When predicting the trajectories, also the observed negative effects of NFC ($\beta = -0.128$) and ADS ($\beta = -0.095$) on their own change to the subsequent measurement should be taken into account. For example, NFC at T1 had a negative effect on change in NFC between T1 and T2 and, consequently, a positive effect on change in ADS between T2 and T3 ($-0.128 \times -0.892 = 0.114$). Hence, although change in NFC had a negative effect on adjacent change in ADS, this does not necessarily translate to NFC having a negative effect on ADS.

Zainal and Newman made a point of using bivariate dual latent change score (BLCS) modeling

solely for analyzing effects of change in NFC on adjacent change in ADS, and vice versa. They used a random intercept cross-lagged panel model (RI-CLPM) for analyzing the effects of level of NFC at time T on the level of ADS at time T+1 while adjusting for level of ADS at time T, and vice versa. However, assuming a certain level of NFC and ADS at time T, findings from bivariate dual latent change score (BLCS) analyses translate neatly to predicted subsequent levels of NFC and ADS, as subsequent level at T+1 equals the previous level at time T plus change. Hence, the results from dual latent change score (BLCS) analyses and random intercept cross-lagged panel models (RI-CLPM) should converge. A failure to converge suggests that at least one of the analyses may be called into question.

In analyses (script available at the Open Science Framework at <https://osf.io/xwp7n/>) employing R 4.1.0 statistical software (R Core Team, 2021) and coefficients from Zainal and Newman, we used 1, 4, and 7 as initial values for NFC (which was measured on a scale of 1—7), 1, 3, and 6 as initial values for ADS (measured on a scale of 1—6), and 0 as the initial value for ΔNFC and ΔADS . We predicted subsequent changes in and levels of NFC and ADS in ten steps according to equations 1—4, updating the input values in each step.

$$\Delta\text{NFC}_{T,T+1} = 0.54 - 0.128 \times \text{NFC}_T - 0.509 \times \Delta\text{ADS}_{T-1,T} \quad (1)$$

$$\Delta\text{ADS}_{T,T+1} = 0.21 - 0.095 \times \text{ADS}_T - 0.892 \times \Delta\text{NFC}_{T-1,T} \quad (2)$$

$$\text{NFC}_{T+1} = \text{NFC}_T + \Delta\text{NFC}_{T,T+1} \quad (3)$$

$$\text{ADS}_{T+1} = \text{ADS}_T + \Delta\text{ADS}_{T,T+1} \quad (4)$$

Figure 1 shows predicted ten-year-trajectories, based on the equations above with the coefficients reported by Zainal and Newman, for each of the nine combinations of initial values for NFC and ADS. ADS for those with low initial ADS (first row) was generally predicted to increase over time. However, a larger increase was predicted for those with high (third column) compared to low (first column) initial NFC. Conversely, ADS for those with high initial ADS (third row) was predicted to decrease over time and the predicted decrease was larger for those with low compared to high initial NFC.

The present predictions, based on findings by Zainal and Newman, could be interpreted as showing that high levels of NFC at a certain point in time predict a worse subsequent development in ADS compared to low initial levels of NFC. This would be in stark contrast to the conclusions drawn by Zainal and Newman and to the results from their random intercept cross-lagged panel model (RI-CLPM). Possible explanations for the contradictory results include the susceptibility of latent change score modeling to the influence of regression to the mean when adjusting for the initial value on the outcome (Sorjonen et al., 2021), similarly to ordinary regression analyses (Castro-Schilo and Grimm, 2018; Eriksson and Häggström, 2014; Glymour et al., 2005).

Figure 1. Predicted trajectories for NCA (gray lines) and ADS (black lines) across a ten-year period, separately for three different levels of initial ADS (rows) and initial NFC (columns). Note: Predictions below 1 (dashed line) are outside the range of possible values.

In summary, the results in Zainal and Newman's study indicate both negative adjusted effects between changes in NFC and ADS and, simultaneously, a positive effect of NFC on subsequent development in ADS. Due to this contradiction, we suggest that the findings reported in the paper by Zainal and Newman should be interpreted with caution, and not be seen to lend strong support to hypotheses about a causal effect of NFC on decreased ADS.

References

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