**Method**

**Participants**

One hundred and twenty participants were recruited from the University of Amsterdam and personal networks. The majority were recruited through messages in WhatsApp group chat rooms of students of the University of Amsterdam, with a link to the questionnaire. No reward for participation was offered. Participants were excluded if they submitted an incomplete answer to the questionnaire. The final sample for analysis was 117 people.

**Materials**

***Measurements***

**Dark Triad Questionnaire.** A 30-item personality questionnaire was created based on the theory of the Dark Triad (Paulhus & Williams, 2002). According to Paulhus and Williams, the Dark Triad consists of three non-pathological and offensive personality traits that are distinct, but overlapping – non-pathological Narcissism (which will be referred to as “Narcissism” in this paper), Machiavellianism and non-pathological Psychopathy (which will be referred to as “Psychopathy” in this paper). The questionnaire comprised three dimensions – one for each personality trait, with 10 items per dimension. The questions were loosely based on the Short Dark Triad questionnaire (Jones & Paulhus, 2014). Each item presented a statement that participants had to rate on how much they agreed with it. The rating was done on a 5-point Likert scale (Likert, 1932), ranging from “Strongly Disagree” to “Strongly Agree”. An example item from the “Narcissism” dimension is “My stories are always interesting”, one from the “Machiavellianism” dimension is “I tend to remember what people tell me, in case I can use it later”, and one from the “Psychopathy” dimension is “People often tell me I am extraordinary”. The full questionnaire can be found in Appendix A.

**Procedure**

As participation in the study only required completion of the questionnaire, any person who received the link to the questionnaire could participate using their own device. Clicking on the questionnaire link led to a Qualtrics page (Qualtrics Inc., 2005). Due to limitations of the version of Qualtrics used for this study, an opening page with instructions was not presented. Therefore, the link led to the first page of questions. For better attention retention, the questionnaire was split into five pages of six questions each, with a progression bar on top of the page, showing how far the participant had progressed. After completing the five pages of questions, a “thank you” message was displayed.

**Data Analysis**

To assess the questionnaire's psychometric qualities, an Item Response Theory (IRT), Confirmatory Factor Analysis (CFA), and Exploratory Factor Analysis (EFA) were used.

The relationship between each item and the latent trait it was intended to measure was evaluated using the graded response model (GRM) of IRT. This model was chosen because it is well-suited for ordinal response data, such as the 5-point Likert scale that was utilized in the questionnaire. Before conducting the IRT analysis, the assumption of unidimensionality was checked using a parallel analysis of the polychoric correlation matrix. This method compares the observed eigenvalues from the data to those generated from random data sets (parallel analysis) to determine the appropriate number of factors. A scree plot was produced to visualize the eigenvalues, to verify whether each dimension (Narcissism, Machiavellianism and Psychopathy) was represented by a single factor. The equality of discrimination parameters across items within each dimension was tested using the likelihood ratio, to check which model, constrained or unconstrained, was favoured. Subsequently, the discrimination parameters for each item were estimated. The discrimination parameter measures how well an item differentiates between respondents with different levels of the latent trait (e.g., different levels of Narcissism). A test information function was generated for each dimension to assess how well the questionnaire measured the latent traits at different levels. Item-rest correlations were calculated to assess how well each item correlates with the total score of the remaining items in its dimension. Items with low discrimination values and low correlations were marked for potential removal. Cut-off points of 0.35 for discrimination parameters and 0.1 for item-rest correlation were selected (Furr, 2021). Furthermore, reliability estimates for each dimension were computed. These included Cronbach's Alpha, a measure of internal consistency that shows how well the items within each dimension cohere to measure the same underlying construct and the Greatest Lower Bound (GLB), a reliability estimate that acts as a lower bound on the true reliability and provides a more conservative estimate of internal consistency than Cronbach's Alpha. To determine whether the removal of items improved the overall internal consistency, reliability statistics were estimated twice, once before dropping items and once after.

After removing poorly performing items based on the IRT analysis, a confirmatory factor analysis (CFA) was conducted to test the hypothesized factor structure of the questionnaire. The model was based on the theoretical framework that states that there are three separate but related dimensions (Narcissism, Machiavellianism, and Psychopathy) underlying the dark triad. The goodness-of-fit of the CFA model was assessed using the Chi-Squared test statistic, Comparative Fit Index (CFI), Tucker-Lewis index (TLI), and Root Mean Square Error of Approximation (RMSEA). The Chi-Square Test provides an overall measure of model fit, while the CFI and TLI compare the fit of the hypothesized model to a baseline model with no relationships between variables. The RMSEA measures the fit of the model per degree of freedom, with values below 0.08 and 0.05 indicating an acceptable fit and good fit, respectively (Furr, 2021). Furthermore, the modification indices (MI) were examined to identify any potential cross-loadings or residual covariances. Based on these indices, it was checked whether certain adjustments, such as allowing for cross-loadings between the dimensions of Narcissism and Psychopathy, improved the overall model fit.

Following the CFA, an exploratory factor analysis (EFA) was conducted to check whether a better-fitting model existed. The EFA was run using a maximum likelihood extraction method and promax rotation, which allows for factors to correlate. This is appropriate for constructs like the dark triad, where dimensions may be interrelated. Several models with different numbers of factors were tested and compared using fit indices such as RMSEA, Chi-Squared test statistic, and its corresponding p-value, and Bayesian Information Criterion (BIC), which can help pinpoint a model with better statistical fit compared to our initial 3-factor model. In addition to statistical criteria, the factor loading matrices of these models were evaluated to determine which model was the most conceptually meaningful. The meaning of a model was examined based on how items loaded on different factors in this analysis.

***Software used***

Analyses were conducted using RStudio (v2024.12.1+563, RStudio Team, 2020).