



## The structure of the Dark Triad traits: A network analysis

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### ABSTRACT

Growing interest in the exploration of the dark side of personality recently led to the questions concerning the number, distinctiveness, and structural organization of its components. The main goal of the current study ( $N = 1012$ ) is to explore the structure of the Dark Triad traits using the network approach. The results showed that all of the traits formed a single network forming two dimensions. However, agentic facets of narcissism were least related to Machiavellianism and psychopathy, which suggests the partial distinctiveness of the trait. Also, the antagonistic facet of narcissism mediated the relations between most of the agentic facets of narcissism and Machiavellianism and psychopathy. Finally, Machiavellianism and psychopathy were located in close proximity, which reflects their core status in the Dark Triad. The interpretation of the results and limitations of the study are further discussed.

### 1. Introduction

The Dark Triad refers to three socially malevolent personality dimensions, namely subclinical narcissism, subclinical psychopathy, and Machiavellianism (Paulhus & Williams, 2002). Although distinct from each other, they share the common core features of callousness and manipulation (Paulhus, 2014). A growing interest in the exploration of the dark side of personality led, however, to the re-analysis of the Dark Triad structure and raised questions concerning the number and distinctiveness of its components (e.g., Furnham, Richards, & Paulhus, 2013), making it unclear how these traits are structurally organized.

Rogoza, Kowalski, and Schermer (2019) raised two questions regarding the structure of the Dark Triad: 1) Are Machiavellianism and psychopathy, as currently measured, redundant?; and 2) Does narcissism belong in the Dark Triad? A meta-analysis conducted by Vize, Lynam, Collison, and Miller (2018) seems to support the validity of these concerns, as there was substantial overlap between psychopathy and Machiavellianism which, unlike narcissism, did not exhibit distinct empirical profiles. Moreover, some research shows that the structure of the Dark Triad can be better represented by the differentiation of the Dark Dyad (Machiavellianism and psychopathy) and narcissism (Rogoza & Ciecuch, 2019) with the former representing pure antagonism and the latter representing constant exploiting and demanding admiration (Rogoza & Ciecuch, 2018). A possible reason for the overlap observed in self-report investigations, is that Machiavellianism

seems to be nested within psychopathy (Rogoza & Ciecuch, 2018), is an indicator of the primary psychopathy, and reflects its affective deficits such as selfishness, lack of interpersonal affect, and remorselessness (Glenn & Sellbom, 2015). This notion echoes also in assessment-related papers confirming the similarities between psychopathy and Machiavellianism, which may be understood as a reflection of their common behavioral core (manifesting in subclinical and clinical population in diverse manners – Persson, Kajonius, & Garcia, 2019; Persson, 2019).

Still, despite substantial literature suggesting that Machiavellianism and psychopathy are redundant, the debate is in no way one-sided. For instance, Jones and Paulhus (2017) found that individuals who scored high in psychopathy tended to cheat in a coin-flip task when there was high-risk of punishment, while those high in Machiavellianism only did so when they were ego-depleted. Moreover, Jones and Weiser (2014) found that both psychopathy and Machiavellianism predicted infidelity in relationships, but only psychopathic infidelity led to relationship dissolution. This finding suggests that high-Machs are more deliberate in their infidelity and are able to avoid situations where the risk of relationship dissolution is high. Thus the first question we intend to answer involves the position of Machiavellianism in the Dark Triad structure. Is it redundant as a derivative of psychopathy or does it contribute to some unique dark personality features?

On the other hand, the strong relation between psychopathy and Machiavellianism supports the formation of the Dark Dyad model and the exclusion of narcissism based on its distinctiveness from the other

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two traits (Kowalski, Vernon, & Schermer, 2016). Narcissism, contrary to Machiavellianism and psychopathy has the essential features of not only antagonism, but also agency (Back, 2018); however, only the latter is predominately studied in the field of the Dark Triad research (Rogoza, Żemojtel-Piotrowska, & Campbell, 2018). In this vein, Rogoza et al. (2019) provided evidence that analyzed the Dark Triad traits in the context of the Circumplex of Personality Metatraits Model (Strus & Cieciuch, 2017). The results revealed that analyzing both agentic (admiration) and antagonistic (rivalry; see Back, 2018) facets of narcissism suggests the incorporation of only the former within the construct of the Dark Triad, which has overlapping meta-trait circumplex profiles with Machiavellianism and psychopathy. These results demonstrate that little is known about associations between antagonistic features of narcissism with the Dark Triad. Thus, the second question we are aiming to answer involves the position of narcissism, including its agentic and antagonistic facets into the Dark Triad structure. To address these two questions, in the current paper we applied the network approach.

### 1.1. Network approach in studying personality traits

Research on personality traits often applies the factor analysis approach to search for latent factors explaining the covariation between sets of observed variables. However, this approach overlooks the fact that the connection between personality traits may be determined by the specific pattern of covariation between the scales (e.g., Cramer et al., 2012). In general, network analysis is appropriate to examine the pattern of relationships between variables, analyzing their structure, interactions and roles they play in the given network (Costantini et al., 2015; Epskamp, Borsboom, & Fried, 2016). Similarities between variables are detected based on the network of pairwise correlations, not necessarily implying the existence of additional latent variables (Costantini et al., 2015).

One of the methods used for analyzing structural relations between personality traits through the network approach is the adaptive LASSO (Costantini et al., 2015). This technique is especially appropriate while using partial correlations. In this case, LASSO helps to avoid overfitting of the model by shrinking the small partial correlations coefficients to zero and providing a basis for conditional independence of given variables. It provides better interpretability of the network structures and helps to control spurious connections (Epskamp & Fried, 2016; Golino & Epskamp, 2017). In addition, it has been highlighted that particular effectiveness of estimation may be observed when LASSO has been combined with community detection algorithms such as Exploratory Graph Analysis (EGA; Golino & Epskamp, 2017). EGA allows to test how many dimensions are possible to differentiate within the network and moreover allows to assess the degree of their stability within dimensions through simulation of multivariate normal networks based on original data (i.e., in how many simulations are the same nodes found within the same dimensions?; Christensen & Golino, 2019). It also provides a measure of similarities between variables based on a random walk, in which the *walktrap* algorithm is used (Golino & Epskamp, 2017).

In the network approach, each trait is considered a node which may be connected with other nodes through ties/edges. All of the connections between nodes are considered a network. Usually, to describe a network, three centrality measures are investigated: closeness, betweenness, and degree (labeled strength in weighted networks). Closeness is defined as the inversed sum of the distances of the focal node from all the other nodes in the network. A closeness-central personality characteristic is likely to be able to quickly influence other characteristics within the network. Betweenness measures how often a node bridges the shortest path between two other nodes. Betweenness-central personality characteristics are necessary for other characteristics to directly influence each other. Strength is defined as the weighted number of connections to the focal node. The strength-central

personality characteristic can influence many other characteristics, without considering the mediating role of other nodes (Clifton & Webster, 2017; Costantini et al., 2015).

### 1.2. How can the network approach contribute to understanding the relations between dark triad traits?

Network approach can facilitate the understanding of inconsistencies associated with the Dark Triad. Firstly, it would enable to test whether the Dark Triad traits form a single network. If so, this would help to answer the question about the role of grandiose narcissism (with both agentic and antagonistic facets) within the Dark Triad. This would demonstrate which of the traits are more central for the Dark Triad, and which are peripheral. Moreover, owing to the network approach, one could look for similarities and dissimilarities between the traits, which would facilitate the distinction between psychopathy and Machiavellianism. Finally, the network approach would provide additional information about the structural organization of the Dark Triad.

Dinić, Wertag, Tomašević, and Sokolovska (2020) applied the network approach to the Dark Tetrad traits (i.e., Dark Triad and sadism, see Kowalski, Di Piero, Plouffe, Rogoza, & Saklofske, 2019 for review) on three independent samples. They confirmed that the Dark Tetrad traits form a single network, which justifies treating them under a common umbrella. In each sample, the agentic facet of narcissism was peripheral in its relation to other Dark Tetrad traits. They argue that psychopathy is the most central and that secondary psychopathy could be excluded from the assessment tools when investigating the “dark core”. In their third sample, however, Dinić et al. (2020) found that at the facet level interpersonal manipulateness, lack of affective responsiveness, and Machiavellianism were most central, while lack of cognitive response and secondary psychopathy were more peripheral. Moreover, having one trait in the center of the Dark Triad seems to be arbitrary, however, as Paulhus (2014) states that the dark personality refers to socially offensive traits, making social malevolence its core, while psychopathy only comprise its elements. Given the peripheral position of narcissism, one might question how the network would look if the antagonistic facet would also be considered? Finally, should secondary psychopathy be expelled? Although primary psychopathy emerged as a central node (Dinić et al., 2020), it should not be surprising given the fact that some researchers mark Machiavellianism as an indicator of primary psychopathy (Miller, Hyatt, Maples-Keller, Carter, & Lynam, 2017; Persson, 2019). Thus, we re-analyze the role of primary and secondary psychopathy to test whether secondary psychopathy should be removed.

## 2. Current study

The goal of the current study is to explore the structure of the Dark Triad traits through the lens of the network approach. We aim to extend previous work on the structure of dark traits (Dinić et al., 2020) by including both agentic and antagonistic facets of narcissism into our analysis and assess their relations with psychopathy (primary and secondary) and Machiavellianism.

Given the reviewed literature, we have four hypotheses. The first hypothesis was that all of the Dark Triad traits will form a single network, that is, neither node would be disconnected from the network. Second, the agentic facet of narcissism is expected to form a distinct (i.e., agentic) dimension, while all remaining traits are expected to form a second (i.e., antagonistic) dimension. Third, the antagonistic facet of narcissism is hypothesized to be a central node (i.e., having both high closeness and betweenness centrality), connecting agentic facets of narcissism to Machiavellianism and psychopathy, thus – it is expected to be a bridge, controlling a large amount of information flowing between the Dark Triad. Fourth, Machiavellianism and psychopathy are hypothesized to be located in close proximity, reflecting their similarity, however, they should be grouped in such a way as to reflect their

dissimilarity – while secondary psychopathy should be located near another psychopathy measure, primary psychopathy is expected to be located near Machiavellianism (Glenn & Sellbom, 2015). Moreover, Machiavellianism and psychopathy are expected to be more central (i.e., have high closeness centrality – in contrast to the antagonistic facet of narcissism, which is expected to have both high closeness and betweenness centrality) to the Dark Triad, given the fact they fall into the description of the “dark personality” (Paulhus, 2014). All of the data and statistical scripts used in the current study are available at: <https://osf.io/a82hg/>

### 3. Method

#### 3.1. Participants and procedure

The sample comprised 1012 participants aged 17 to 35 years, 202 men ( $M = 22.28$ ;  $SD = 3.26$ ) and 810 women ( $M = 22.38$ ;  $SD = 3.49$ ). Participants were recruited using social media and completed questionnaires anonymously online. The work presented in this manuscript was part of a larger data collection effort (more details: Rogoza & Cieciuch, 2018, 2019), but the current study reports novel analyses.

#### 3.2. Measures

##### 3.2.1. Short Dark Triad (SD3)

We measured the Dark Triad traits using the SD3 (Jones & Paulhus, 2014; Polish adaptation: Rogoza & Cieciuch, 2019). The SD3 has 27 items rated on a five-point Likert-type scale. Cronbach's alphas obtained in this study were satisfactory or borderline: 0.73 for narcissism, 0.67 for psychopathy, and 0.73 for Machiavellianism.

##### 3.2.2. Narcissistic Personality Inventory (NPI)

Narcissism was assessed using the Polish adaptation of the NPI (Raskin & Hall, 1979; Polish adaptation: Bazińska & Drat-Ruszczak, 1999). The Polish NPI consists of 34 items rated on a four-point Likert-type scale. Cronbach's alpha obtained in this study was satisfactory ( $\alpha = 0.94$ ).

##### 3.2.3. Narcissistic Admiration and Rivalry Questionnaire (NARQ)

Narcissism was also assessed using the Polish adaptation of the NARQ (Back et al., 2013; Polish adaptation: Rogoza, Rogoza, & Wyszynska, 2016). The NARQ comprises 18 items measuring two facets of narcissism (agentic admiration and antagonistic rivalry). The items are rated on a six-point Likert-type scale. Cronbach's alphas obtained in this study were satisfactory: 0.85 for admiration, and 0.83 for rivalry.

##### 3.2.4. Mach-IV

To assess Machiavellianism we used the MACH-IV (Christie & Geis, 1970; Polish translation: Pospiszyl, 2000) which comprises 20 items rated on a seven-point Likert-type scale. Cronbach's alpha obtained in this study was satisfactory ( $\alpha = 0.77$ ).

##### 3.2.5. Levenson's Self-Report Psychopathy (LSRP) scale

Primary and secondary psychopathy were assessed using the LSRP (Levenson, Kiehl, & Fitzpatrick, 1995; Polish translation made by Rogoza and Cieciuch with the permission and in correspondence with the author of the scale). The LSRP has 26 items and is rated on a four-point Likert-type scale. Cronbach's alphas obtained in this study were satisfactory or borderline: 0.86 for primary psychopathy, and 0.61 for secondary psychopathy.

### 4. Results

The descriptive statistics and intercorrelations of all study variables can be found at the OSF project page. Fig. 1 illustrates the network of the Dark Triad traits estimated from the EGA, while Fig. 2 lists the

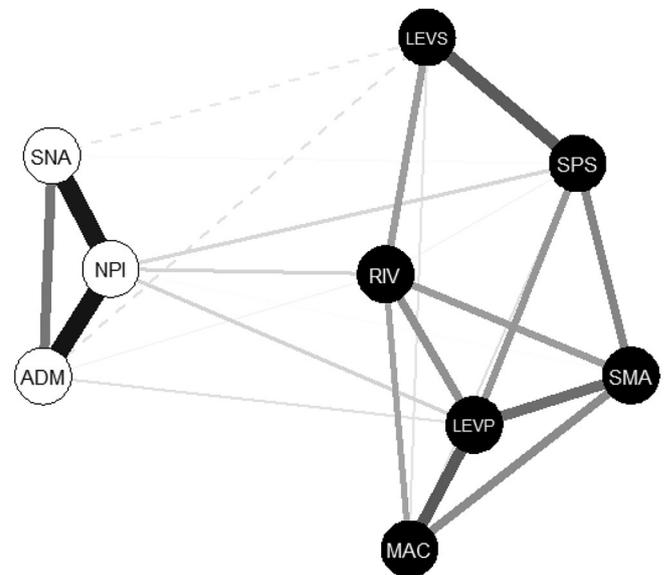


Fig. 1. The network of the Dark Triad traits.

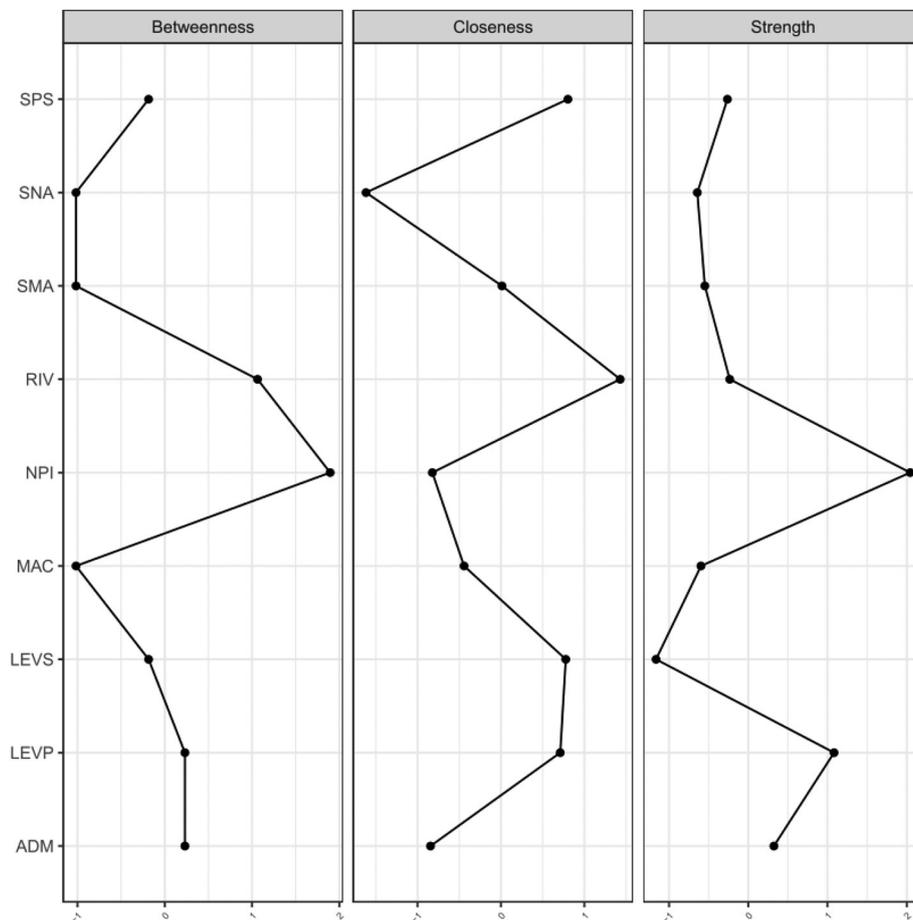
Note. SNA = SD3 narcissism; SMA = SD3 Machiavellianism; SPS = SD3 psychopathy; NPI = NPI narcissism; RIV = rivalry; ADM = admiration; MAC = MACH-IV Machiavellianism; LEVP = primary psychopathy; LEVS = secondary psychopathy. Dashed line means negative relation. Color of the circle (i.e., black vs white) resembles assignment to the given dimension. The coefficients corresponding to the lines on the graph are presented as supplementary materials on OSF project page.

centrality estimates for all network variables.<sup>1</sup> For assessment of EGA scale stability, we bootstrapped 1000 simulations. To assess whether the model identified in EGA fits the data well, we employed confirmatory factor analysis using maximum likelihood estimation.

All of the traits entered into the analysis formed a single network; thus confirming the first hypothesis. Within this network, however, all of the traits were located differently, forming two distinct dimensions, which were successfully replicated in 99% of simulations. This model was well fitted to the data accordingly to conventional criteria ( $\chi^2_{(26)} = 378.40$ ;  $p < 0.001$ ; CFI = 0.933; RMSEA = 0.116) and both latent factors were positively correlated at  $\rho = 0.45$  ( $p < 0.001$ ). The first dimension was composed of typically used measures of (agentic) narcissism in the field of the Dark Triad (SNA and NPI); they were highly related to each other as well as to admiration from the NARQ (ADM). The scale allocation to this dimension was very stable, all of which replicated in every simulation. These strong relations are also visible in the high values of the betweenness and strength for the NPI, which mediates the relations between agentic facets (SNA and ADM) to other variables. However, the estimate of closeness for NPI was low, suggesting that its role, although important, is still peripheral for the Dark Triad. Thus, we provided empirical support that these are all indices of agentic facets of narcissism (i.e., they yielded separate dimension) and as expected in hypothesis two, these agentic facets were in the least proximity to Machiavellianism and psychopathy, providing support for their, at least, partial distinctiveness.

The second dimension was composed of the antagonistic facet of narcissism, namely narcissistic rivalry (RIV), and remaining measures of psychopathy and Machiavellianism. The scale allocation to this dimension was also high, with 99% replication of secondary psychopathy and SD3 psychopathy, to 100% of all other scales. Rivalry, mediated most of the relations between agentic facets of narcissism to the

<sup>1</sup> We also tested the edge-weight accuracy and centrality stabilities, and scrutinized the differences between them through the bootstrapped difference test. The results of these analyses are available at the OSF project site.



**Fig. 2.** Centrality coefficients of the dark traits. Presented scores are standardized.  
*Note.* Scale abbreviations are explained in Fig. 1 caption.

Machiavellianism and psychopathy. This claim is also supported by the high values of the closeness and betweenness estimates, which also supports the claim that rivalry is responsible for the flow of information between (agentic) narcissism to Machiavellianism and psychopathy.<sup>2</sup> Despite the low estimates of the strength, rivalry seemed to be a key variable in this network, supporting hypothesis three.

Finally, Machiavellianism and psychopathy were grouped in close proximity (i.e., forming one dimension), however, the distances between them allow for their meaningful distinction, providing support for both, similarity and dissimilarity. As expected, primary psychopathy (LEVP), appeared to be a better indicator of Machiavellianism (MAC and SMA), having highest estimates of closeness and strength. However, due to low estimates of betweenness, it should be not interpreted as the crucial variable for the Dark Triad. Given the fact that most of the Machiavellianism and psychopathy measures had medium to high estimates of closeness, one might interpret that these are more central for the Dark Triad than the agentic facet of narcissism, providing support for the fourth hypothesis.

## 5. Discussion

There has been debate surrounding whether narcissism should be included in the Dark Triad because of its dissimilarity from the other

<sup>2</sup> We also tested whether rivalry is central to the Dark Triad if agentic facets were removed from the analysis. Rivalry was no longer a central node. In turn, primary psychopathy appeared to be most central. This explains that rivalry is central because it links agentic facet of narcissism to more antagonistic traits of Machiavellianism and psychopathy.

two traits (Rogoza et al., 2019). Psychopathy and Machiavellianism, however, are frequently the topic of debate concerning their adaptiveness. Some argue that psychopathy is partially adaptive due to the trait's boldness (e.g., Neo, Sellbom, Smith, & Lilienfeld, 2018), others counter this point by suggesting that boldness is not central to psychopathy and therefore, not an indication of the trait's adaptiveness (e.g., Crego & Widiger, 2014; Lynam & Miller, 2012). It is possible that psychopathy and Machiavellianism were able to persist over time due to the short-term benefits that come with these personality styles (Gladden, Figueredo, & Jacobs, 2009). Although narcissism is a complex construct (Back, 2018) comprising of agentic and antagonistic facets, research on the Dark Triad and its structure is primarily focused on the former (e.g., Dinić et al., 2020). As agentic narcissism does not conform to the definition of the dark personality trait, that is, it is not as socially aversive (Paulhus, 2014), studying the role that antagonistic facets play in the Dark Triad is utterly important to move the field forward. In other words, the antagonistic facet of narcissism has much more in common with the Dark Triad than its agentic counterpart.

In order to investigate the Dark Triad structure, we used network analysis because of its benefits that go beyond the more commonly used correlational or factor analysis approaches (Dinić et al., 2020). Analyzing the location (central or peripheral), connections, and similarities of the Dark Triad in the network allowed us to determine if they form a single network, to visualize the positions of antagonistic vs. agentic narcissism traits in the structure, and to determine whether Machiavellianism and psychopathy are distinct.

Four hypotheses were outlined and all were supported. The first hypothesis was that the three traits, psychopathy, Machiavellianism, and narcissism, would form a single network. As shown in Fig. 1, this

hypothesis was supported in that no nodes were distinct from the network. This supports the idea that the three traits fit together into a single Dark Triad structure. For example, if one of the traits would be disconnected from all other nodes, one might question if it is feasible to interpret these traits under a common umbrella of the Dark Triad.

The second hypothesis was that the agentic facet of narcissism would be the least related to the other (antagonistic) traits. This was supported as the agentic narcissism traits were grouped within a single dimension, furthest from Machiavellianism and psychopathy, but were still in the network. These results support the idea that commonly used measures of narcissism (i.e., SD3 and NPI) do not capture the antagonistic facet of narcissism, leading to inconclusive results and providing further evidence on disentangling the bright and dark side of narcissism (Back, 2018). Third, it was hypothesized that the antagonistic facet of narcissism would be a central node connecting narcissism to psychopathy and Machiavellianism. This was supported in that the antagonistic facet of narcissism was a part of the (antagonistic) dimension and mediated most of the relationships between the agentic facets to the rest of the Dark Triad. In short, the antagonistic facet of narcissism acted as a bridge between agentic narcissism traits and Machiavellianism and psychopathy. These findings suggest that narcissism, due to the antagonistic facet, does belong in the Dark Triad structure despite its differences from the other two traits. These results mean that past research using the aforementioned measures did not analyze the dark side of narcissism adequately. This might be a reason why the findings presented above seem to contradict the results of previous research supporting psychopathy or its facets (mainly interpersonal manipulation and callousness) as the key components of malevolent/dark personality and Dark Triad/Tetrad (Dinić et al., 2020; Jones & Figueredo, 2013; Marcus, Preszler, & Zeigler-Hill, 2018). In the study, we decided to use both SD3 and NPI, which are standard measures of subclinical narcissistic personality features and therefore were used in previously presented studies. However, in contrast to previous research, we also used a NARQ – a different measure of narcissism, with the ability to measure two separate facets of subclinical narcissistic personality: agentic admiration and antagonistic rivalry (Back, 2018). When NARQ was included in our analysis, the rivalry aspect was central, further enforcing the idea that the antagonistic aspects of narcissism are what make the trait belong in the Dark Triad. Many studies use the NPI when investigating the Dark Triad (e.g., Dinić et al., 2020; Miller et al., 2017), so it is not surprising that researchers highlight that Machiavellianism and psychopathy are consistently related to antisocial tendencies, playing a central role as a core element of the Dark Triad/Tetrad and narcissism is not (Rogoza et al., 2019), as they studied qualitatively different constructs. This can also explain why narcissism has been referred to as “brighter” than psychopathy and Machiavellianism (Rauthmann & Kolar, 2012). Narcissism is a dark trait, but has two facets with different behavioral pathways and only one of which is apparently dark in nature, leading, e.g., to unpopularity (Leckelt et al., 2019).

Finally, it was hypothesized that Machiavellianism and psychopathy would be in close proximity in the network, however, still be far enough apart to support a meaningful distinction between the two traits. This hypothesis was mostly supported as all antagonistic traits formed a single dimension. More specifically, primary psychopathy was located closer to Machiavellianism measures. The closeness of the two could be due to the finding that primary psychopathy encompasses the core of all Dark Triad traits (callousness & manipulation; Jones & Figueredo, 2013). In turn, secondary psychopathy was grouped close to the psychopathy measure, confirming its validity as a psychopathy indicator. This is in contrast to Dinić et al. (2020), who claimed that secondary psychopathy should be expelled from the Dark Core assessment tools and that primary psychopathy is most central. Secondary psychopathy was peripheral, as it was the only scale to capture purely psychopathic traits in their sample. Thus, the interpretation that secondary psychopathy is redundant, in the light of our results, is inappropriate, as it

would exclude psychopathy from the studied Dark Triad (Tetrad) network completely. Dinić et al.'s (2020) position that psychopathy is the central feature of the Dark Triad (Tetrad) network also seems to be too arbitrary, as upon introduction of the antagonistic facet of narcissism, psychopathy was not the most central node. Thus, we advocate for a slightly different interpretation, which is consistent with Paulhus's (2014) suggestion that the central feature of the Dark Triad (Tetrad) is antagonism, social aversiveness, and malevolence.

Contrary to Vize et al.'s (2018) meta-analysis, indicating a substantial overlap between psychopathy and Machiavellianism, our results suggest that while those traits are similar (i.e., grouped around antagonism), they are potentially distinct enough to warrant separation. This is consistent with previous research that has found similar patterns. For example, Machiavellianism positively predicts fluid intelligence while psychopathy does not (Kowalski et al., 2018). Several behavioral studies have been conducted that demonstrate contextual differences between the two traits. For example, it has been found that high Machiavellians were more flexible in their mate retention tactics (Jones & de Roos, 2017). Our work serves as a clue into the ongoing debate surrounding Machiavellianism and psychopathy; however, further research needs to be done.

### 5.1. Limitations

There are some limitations to this study that are worth noting. First, the sample was comprised of only Polish residents, so these results may not generalize to other populations. Future research should investigate the Dark Triad network in other samples. However, this could also be a strength of the study as a Polish sample is not a classic W.E.I.R.D. sample (Henrich, Heine, & Norenzayan, 2010) and the sample size was large. Next, as mentioned above, we did not conduct a redundancy test so the results should be interpreted with a grain of salt. The similarities between the results of the current study and the results of previous papers mentioned above suggests that the unique characteristics of our sample are evidence for the validity of the study. The fit of the model identified in EGA accordingly to the RMSEA statistic was poor, however, given the low number of the degrees of freedom, this result might be artificially high (Kenny, Kaniskan, & McCoach, 2015). Further, the sample was mostly female. Research suggests that dark traits are more common in males, thus, this sample may not be representative of the population, although the results for males and females were similar (see OSF project page).

All measures were self-report in nature. Although self-report measures are easier to administer, it would be useful in the future to explore the structure of the Dark Triad using peer report or multi-method, multi-responder methods. This, along with these findings, would provide a more detailed investigation into the organization of the Dark Triad. The reduction of the complexity of the Dark Triad is reflected also in the fact that each trait was understood as sum scores, while some studies are taking a slightly different approach to the self-report measures of the Dark Triad (e.g., through the item analysis – see Persson, 2019). However, using sum scores as indicators of latent traits is essentially no different from the traditionally adopted strategy of measuring the Dark Triad. In the current study, the Polish NPI was treated as a unidimensional measure because it includes only two of the Entitlement/Exploitativeness scale items. Not including subscales of NPI might have limited our conclusions concerning the position of more maladaptive aspects of narcissism within the network, however, previous studies using the Polish version of NPI to assess grandiose narcissism show that its results are consistent with those obtained for the original version (e.g. (Czarna, Leifeld, Śmieja, Dufner, & Salovey, 2016; Czarna, Wróbel, Dufner, & Zeigler-Hill, 2015). Moreover, measuring narcissism not only with NPI but also with NARQ allowed us to address the multidimensional character of narcissism and draw conclusions concerning the position of its agentic and antagonistic facets in the Dark Triad network. Moreover, we did not include a measure of sadism,

which might have influenced the structure of the network given its relations to other dark personality traits (Kowalski et al., 2019); however we do not argue any specific trait is central for the Dark Triad. It is possible that its roots may lay in social antagonism, however no measure of antagonism (understood as independent construct as seen by Harkness, McNulty, & Ben-Porath, 1995; or aspect of some of the Dark Triad traits, e.g. Machiavellianism – see Collison, Vize, Miller, & Lynam, 2018) was included in the presented analysis. Therefore, the core role of antagonism in the constellation of the Dark Triad may be seen as a hypothesis rather than a strong conclusion.

Finally, the correlation coefficients presented in the article were partial correlations and not zero-order correlations. Thus, the interpretation of these coefficients may be somewhat challenging. Recent research showed that once the variance shared with narcissism and psychopathy is removed, Machiavellianism becomes more strongly related to the traits outside the Dark Triad (e.g., depression, anxiety; Sleep, Lynam, Hyatt, & Miller, 2017). Therefore, we recommend to reserve particular precaution while interpreting those correlations.

## 6. Conclusion

This study, following the results reported in Dinić et al. (2020) supports the idea of the Dark Triad as a single network with three overlapping yet distinct traits; however, not in the way it was frequently studied within the literature. Narcissism is a trait which encompasses antagonism, thus fitting within the definition of a dark personality trait (Paulhus, 2014), but it also encompasses an agentic facet, which does not fit well with this definition. Neglecting the antagonistic facet of narcissism in research on the Dark Triad, seems to be against its very nature, as it excludes its dark essence, making narcissism to be somewhat different from the other traits and might lead to inconclusive results. Moreover, we provided counter-arguments to Dinić et al. (2020) who suggested removal of secondary psychopathy because it was expected not to be a central component of the Dark Core. In fact, secondary psychopathy might be a better indicator of psychopathy than its primary counterpart, which shares more similar features with narcissism and Machiavellianism (Glenn & Sellbom, 2015). Overall, these findings have implications for the assessment of the dark personalities and should help further the debate surrounding the structure of the Dark Triad.

## CRediT authorship contribution statement

**Cassidy Trahair:** Writing - original draft, Writing - review & editing, Visualization, Resources. **Lidia Baran:** Writing - original draft, Writing - review & editing, Methodology, Resources. **Maria Flakus:** Writing - original draft, Writing - review & editing, Visualization. **Christopher Marcin Kowalski:** Writing - original draft, Writing - review & editing, Resources. **Radosław Rogoza:** Writing - original draft, Writing - review & editing, Methodology, Formal analysis.

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## References

- Back, M. D. (2018). The narcissistic admiration and rivalry concept. In A. Hermann, A. Brunell, & J. Foster (Eds.). *Handbook of trait narcissism* (pp. 57–67). Cham, CH: Springer.
- Back, M. D., Küfner, A. C. P., Dufner, M., Gerlach, T. M., Rauthmann, J. F., & Denissen, J. J. A. (2013). Narcissistic admiration and rivalry: Disentangling the bright and dark sides of narcissism. *Journal of Personality and Social Psychology, 105*, 1013–1037. <https://doi.org/10.1037/a0034431>.
- Bazińska, R., & Drat-Ruszczak, K. (1999). Structure of narcissism in the Polish adaptation

- of the Narcissistic Personality Inventory. *Czasopismo Psychologiczne, 6*, 171–188.
- Christensen, A. P., & Golino, H. F. (2019). Estimating the stability of the number of factors via Bootstrap Exploratory Graph Analysis: A tutorial. <https://doi.org/10.31234/osf.io/9deay>.
- Christie, R., & Geis, F. (1970). *Studies in Machiavellianism*. New York, NY: Academic Press.
- Clifton, A., & Webster, G. D. (2017). An introduction to social network analysis for personality and social psychologists. *Social Psychological and Personality Science, 8*, 442–453. <https://doi.org/10.1177/1948550617709114>.
- Collison, K. L., Vize, C. E., Miller, J. D., & Lynam, D. R. (2018). Development and preliminary validation of a five factor model measure of Machiavellianism. *Psychological Assessment, 30*, 1401–1407. <https://doi.org/10.1037/pas0000637>.
- Costantini, G., Epskamp, S., Borsboom, D., Perugini, M., Mötts, R., Waldorp, L. J., & Cramer, A. O. J. (2015). State of the art personality research: A tutorial on network analysis of personality data in R. *Journal of Research in Personality, 54*, 13–29. <https://doi.org/10.1016/j.jrp.2014.07.003>.
- Cramer, A. O., Sluis, S., Noordhof, A., Wichers, M., Geschwind, N., Aggen, S. H., ... Borsboom, D. (2012). Dimensions of normal personality as networks in search of equilibrium: You can't like parties if you don't like people. *European Journal of Personality, 26*, 414–431. <https://doi.org/10.1002/per.1866>.
- Crego, C., & Widiger, T. A. (2014). Psychopathy, DSM-5, and a caution. *Personality Disorders: Theory, Research, and Treatment, 5*, 335–347. <https://doi.org/10.1037/per0000078>.
- Czarna, A. Z., Leifeld, P., Śmieja, M., Dufner, M., & Salovey, P. (2016). Do narcissism and emotional intelligence win us friends? modeling dynamics of peer popularity using inferential network analysis. *Personality and Social Psychology Bulletin, 42*, 1588–1599.
- Czarna, A. Z., Wróbel, M., Dufner, M., & Zeigler-Hill, V. (2015). Narcissism and emotional contagion: Do narcissists “catch” the emotions of others? *Social Psychological and Personality Science, 6*, 318–324.
- Dinić, B. M., Wertag, A., Tomašević, A., & Sokolovska, V. (2020). Centrality and redundancy of the Dark Tetrad traits. *Personality and Individual Differences, 155*, Article 109621. <https://doi.org/10.1016/j.paid.2019.109621>.
- Epskamp, S., Borsboom, D., & Fried, E. I. (2016). Estimating psychological networks and their accuracy: A tutorial paper. (arXiv: 1604.08462).
- Epskamp, S., & Fried, E. I. (2016). Estimating regularized psychological networks using qgraph. (arXiv preprint: 1607.01367).
- Furnham, A., Richards, S. C., & Paulhus, D. L. (2013). The Dark Triad of personality: A 10 year review. *Social and Personality Psychology Compass, 7*, 199–216. <https://doi.org/10.1111/spc3.12018>.
- Gladden, P. R., Figueredo, A. J., & Jacobs, W. J. (2009). Life history strategy, psychopathic attitudes, personality, and general intelligence. *Personality and Individual Differences, 46*, 270–275. <https://doi.org/10.1016/j.paid.2008.10.010>.
- Glenn, A. L., & Sellbom, M. (2015). Theoretical and empirical concerns regarding the Dark Triad as a construct. *Journal of Personality Disorders, 29*, 360–377. <https://doi.org/10.1521/pedi.2014.28.162>.
- Golino, H. F., & Epskamp, S. (2017). Exploratory Graph Analysis: A new approach for estimating the number of dimensions in psychological research. *PLoS One, 12*, Article e0174035. <https://doi.org/10.1371/journal.pone.0174035>.
- Harkness, A. R., McNulty, J. L., & Ben-Porath, Y. S. (1995). The Personality Psychopathology Five (PSY-5): Constructs and MMPI-2 scales. *Psychological Assessment, 7*, 104–114. <https://doi.org/10.1037/1040-3590.7.1.104>.
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences, 33*, 61–83. <https://doi.org/10.1017/S0140525X0999152X>.
- Jones, D. N., & de Roos, M. S. (2017). Machiavellian flexibility in negative mate retention. *Personal Relationships, 24*, 265–279. <https://doi.org/10.1111/per.12181>.
- Jones, D. N., & Figueredo, A. J. (2013). The core of darkness: Uncovering the heart of the Dark Triad. *European Journal of Personality, 27*, 521–531. <https://doi.org/10.1002/per.1893>.
- Jones, D. N., & Paulhus, D. L. (2014). Introducing the Short Dark Triad (SD3): A brief measure of dark personality traits. *Assessment, 21*, 28–41. <https://doi.org/10.1177/1073191113514105>.
- Jones, D. N., & Paulhus, D. L. (2017). Duplicity among the Dark Triad: Three faces of deceit. *Journal of Personality and Social Psychology, 113*, 329–342. <https://doi.org/10.1037/pspp0000139>.
- Jones, D. N., & Weiser, D. A. (2014). Differential infidelity patterns among the Dark Triad. *Personality and Individual Differences, 57*, 20–24. <https://doi.org/10.1016/j.paid.2013.09.007>.
- Kenny, D. A., Kaniskan, B., & McCoach, B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research, 44*, 486–507. <https://doi.org/10.1177/0049124114543236>.
- Kowalski, C. M., Di Piero, R., Plouffe, R. A., Rogoza, R., & Saklofske, D. H. (2019). Enthusiastic acts of evil: The Assessment of Sadistic Personality in Polish and Italian populations. *Journal of Personality Assessment, 93*, 1080–1089. <https://doi.org/10.1080/00223891.2019.1673760> Advance online article.
- Kowalski, C. M., Kwiatkowska, K., Kwiatkowska, M. M., Ponikiewska, K., Rogoza, R., & Schermer, J. A. (2018). The Dark Triad traits and intelligence: Machiavellians are bright, and narcissists and psychopaths are ordinary. *Personality and Individual Differences, 135*, 1–6. <https://doi.org/10.1016/j.paid.2018.06.049>.
- Kowalski, C. M., Vernon, P. A., & Schermer, J. A. (2016). The General Factor of Personality: The relationship between the Big One and the Dark Triad. *Personality and Individual Differences, 88*, 256–260. <https://doi.org/10.1016/j.paid.2015.09.028>.
- Leckelt, M., Geukes, K., Kufner, A. C. P., Niemeyer, L. M., Hutteman, R., Osterholz, S., Egloff, B., Nestler, S., & Back, M. D. (2019). A longitudinal field investigation of narcissism and popularity over time: How agentic and antagonistic aspects of narcissism shape the development of peer relationships. *Personality and Social Psychology*

- Bulletin*, 46, 643–659. <https://doi.org/10.1177/0146167219872477>.
- Levenson, M. R., Kiehl, K. A., & Fitzpatrick, C. M. (1995). Assessing psychopathic attributes in a noninstitutionalized population. *Journal of Personality and Social Psychology*, 68, 151–158. <https://doi.org/10.1037/0022-3514.68.1.151>.
- Lynam, D. R., & Miller, J. D. (2012). Fearless dominance and psychopathy: A response to Lilienfeld et al. *Personality Disorders: Theory, Research, and Treatment*, 3, 341–353. <https://doi.org/10.1037/a0028296>.
- Marcus, D. K., Preszler, J., & Zeigler-Hill, V. (2018). A network of dark personality traits: What lies at the heart of darkness? *Journal of Research in Personality*, 73, 56–62. <https://doi.org/10.1016/j.jrp.2017.11.003>.
- Miller, J. D., Hyatt, C. S., Maples-Keller, J. L., Carter, N. T., & Lynam, D. R. (2017). Psychopathy and Machiavellianism: A distinction without a difference? *Journal of Personality*, 85, 439–453. <https://doi.org/10.1111/jopy.12251>.
- Neo, B., Sellbom, M., Smith, S. F., & Lilienfeld, S. O. (2018). Of boldness and badness: Insights into workplace malfeasance from a triarchic psychopathy model perspective. *Journal of Business Ethics*, 149, 187–205. <https://doi.org/10.1007/s10551-016-3108-8>.
- Paulhus, D. L. (2014). Toward a taxonomy of dark personalities. *Current Directions in Psychological Science*, 23, 421–426. <https://doi.org/10.1177/0963721414547737>.
- Paulhus, D. L., & Williams, K. M. (2002). The Dark Triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality*, 36, 556–563. [https://doi.org/10.1016/S0092-6566\(02\)00505-6](https://doi.org/10.1016/S0092-6566(02)00505-6).
- Persson, B. N. (2019). Searching for Machiavelli but finding psychopathy and narcissism. *Personality Disorders: Theory, Research, and Treatment*, 10, 235–245. <https://doi.org/10.1037/per0000323>.
- Persson, B. N., Kajonius, P. J., & Garcia, D. (2019). Revisiting the structure of the Short Dark Triad. *Assessment*, 26, 3–16. <https://doi.org/10.1177/1073191117701192>.
- Pospiszyl, K. (2000). *Psychopatia*. Warszawa, PL: Żak.
- Raskin, R., & Hall, C. S. (1979). The Narcissistic Personality Inventory. *Psychological Reports*, 45, 590. <https://doi.org/10.2466/pr0.1979.45.2.590>.
- Rauthmann, J. F., & Kolar, G. P. (2012). How “dark” are the Dark Triad traits? Examining the perceived darkness of narcissism, Machiavellianism, and psychopathy. *Personality and Individual Differences*, 53, 884–889. <https://doi.org/10.1016/j.paid.2012.06.020>.
- Rogoza, R., & Cieciuch, J. (2018). Dark Triad traits and their structure: An empirical approach. *Current Psychology*. <https://doi.org/10.1007/s12144-018-9834-6> Advance online publication.
- Rogoza, R., & Cieciuch, J. (2019). Structural investigation of the Short Dark Triad questionnaire in Polish population. *Current Psychology*, 38, 756–763. <https://doi.org/10.1007/s12144-017-9653-1>.
- Rogoza, R., Kowalski, C. M., & Schermer, J. A. (2019). Dark Triad traits within the framework of the circumplex of personality metatraits model. *Journal of Individual Differences*, 40, 168–176. <https://doi.org/10.1027/1614-0001/a000289>.
- Rogoza, R., Rogoza, M., & Wyszynska, P. (2016). Polska adaptacja modelu narcystycznego podziwu i rywalizacji. *Polskie Forum Psychologiczne*, 21, 410–431. <https://doi.org/10.14656/PPF20160306>.
- Rogoza, R., Żemojtel-Piotrowska, M., & Campbell, W. K. (2018). Measurement of narcissism: From classical applications to modern approaches. *Studia Psychologica: Theoria et Praxis*, 18, 27–48. <https://doi.org/10.21697/sp.2018.18.1.02>.
- Sleep, C. E., Lynam, D. R., Hyatt, C. S., & Miller, J. D. (2017). Perils of partialing redux: The case of the Dark Triad. *Journal of Abnormal Psychology*, 126, 939–950. <https://doi.org/10.1037/abn0000278>.
- Strus, W., & Cieciuch, J. (2017). Towards a synthesis of personality, temperament, motivation, emotion and mental health models within the Circumplex of Personality Metatraits. *Journal of Research in Personality*, 66, 70–95. <https://doi.org/10.1016/j.jrp.2016.12.002>.
- Vize, C. E., Lynam, D. R., Collison, K. L., & Miller, J. D. (2018). Differences among Dark Triad components: A meta-analytic investigation. *Personality Disorders: Theory, Research, and Treatment*, 9, 101–111. <https://doi.org/10.1037/per0000222>.