



The Dark Triad and BIS/BAS: a Meta-Analysis

Katarzyna A. Włodarska¹ · Emilia Zyskowska² · Martyna K. Terebus² · Radosław Rogoza²

Published online: 4 November 2019

© The Author(s) 2019

Abstract

Are there any temperamental predispositions to developing a dark personality traits? Within the current paper we address this question by investigating relations between the temperamental traits of the behavioural inhibition and approach systems (BIS and BAS, respectively) and the Dark Triad traits of personality. For this purpose, we conducted a meta-analysis of 18 studies with a total of 8911 participants. The results partially corroborated existing claims that the Dark Triad traits are a group of high-approach low-avoidance temperamental traits; however, the role of BAS seems to be more important. Among the Dark Triad traits, narcissism seems to be the most related to both the BIS and the BAS. Psychopathy in turn seems to be mostly related to the fun-seeking facet of the BAS. Finally, Machiavellianism appears to be the least related to temperamental traits. Thus, it seems that only narcissism and psychopathy confirm the claim about a connection between the Dark Triad traits and a high-approach low-avoidance temperament.

Keywords Temperament · Dark triad · BIS/BAS · Meta-analysis

Temperament is defined as a relatively consistent, basic and inherent disposition that underlies and modulates the expression of activity, emotionality and sociability among people. Temperament is measurable in early life, and the majority of its elements seem to be strongly influenced by biological factors (Shiner et al. 2012). But are there any temperamental predispositions that could develop into a particular personality, such as a dark personality, that is – those characterized by socially aversive traits falling in the normal range (Paulhus 2014)? The aim of the current study was to investigate the temperamental foundation of the Dark Triad traits of personality: narcissism, Machiavellianism, and psychopathy (Paulhus and Williams 2002).

Behavioural Inhibition and Approach Systems as Basic Dimensions of Temperament

Theoretical neurobiological systems have been introduced to explain the links between biology, personality traits, and

various disorders: depression, anxiety, drug abuse and dependence, alcohol abuse and dependence, attention deficit hyperactivity disorder, and conduct disorder (e.g., Carver and White 1994; Johnson et al. 2003; Ross et al. 2009). In this vein, Gray (1987) defines personality traits as individual differences connected to the reactivity of two basic, separate, brain-motivation systems responsible for behaviour regulation: the aversive and the appetitive motivation systems. Associated with hippocampal activity, the aversive motivation system, named the behavioural inhibition system (BIS; Gray 1987), is responsible for controlling the feelings of anxiety that arise through the influence of specific stimuli. This system is sensitive to the signals of punishment and lack of reward, which in effect leads to not achieving one's goals; consequently, it is strongly associated with negative emotions such as fear, anxiety and frustration (Corr 2004; Corr and McNaughton 2008). The behavioural activation system (BAS; Gray 1987) is associated with dopaminergic function and controls appetitive motivation. This system is sensitive to positive signals, reward and avoidance of punishment, and its activation regulates targeted behaviours; consequently, it is related to positive emotions such as hope and satisfaction (Corr 2004).

Carver and White (1994) pointed out the diversity within the BAS system and distinguished three correlated subsystems: seeking pleasure (Fun Seeking), sensitivity to the prize (Reward Responsiveness) and operation (Drive) (e.g., Leone et al. 2001). More precisely, the three differentiated factors of the BAS comprise: the desire for new rewards and a

✉ Katarzyna A. Włodarska
katarzyna.anna.wlodarska@gmail.com

¹ Institute of Psychology, Cardinal Stefan Wyszyński University in Warsaw, ul. Wóycickiego 1/3 01-938 Warsaw Poland

² Cardinal Stefan Wyszyński University in Warsaw, Warsaw Poland

willingness to immediately approach rewarding events (BAS-Fun); the tendency to focus on positive responses to the occurrence or anticipation of reward (BAS-Reward); and the tendency for the persistent pursuit of desired goals (BAS-Drive) (Carver and White 1994; Cogswell et al. 2006; Cooper et al. 2007; Smits & Boeck 2006). Although such differentiation does not reflect the theoretical assumptions of the original concept of Gray (1987), some scholars suggest that specific cues of punishment and reward are also important (Cogswell et al. 2006; Heubeck et al. 1998; Jorm et al. 1999; Leone et al. 2001; Ross et al. 2002).

The BIS and BAS, as neurobiological systems responsible for behaviour, are theoretically related to many psychopathologies (Johnson et al. 2003) but also to typical personality traits (Smits & Boeck 2006). According to the literature, there are three socially aversive yet non-clinical traits of personality – Machiavellianism, narcissism and psychopathy – commonly referred to as the Dark Triad of personality (Paulhus and Williams 2002).

The Dark Triad of Personality – Phenotypical Descriptions and Ongoing Controversies

The Dark Triad traits are defined primarily by a tendency to be insensitive and unemphatic (Paulhus 2014). More specifically, Machiavellianism refers to an interpersonal trait with a predisposition to have a high motivation and skills to use manipulative tactics in relation to others. Moreover, people scoring high on Machavellianism possess a cynical worldview, detach themselves from conventional morality and are successful in strategic planning (Jones and Paulhus 2009). Thus, they are strongly motivated to achieve their long-term goals without considering any harmful consequences (Christie and Geis 1970; Jakobwitz and Egan 2006). Individuals characterized by high levels of psychopathy tend to use manipulative skills but, unlike those scoring high on Machiavellianism, are more impulsive and prefer risk-taking behaviour and short-term deceiving. This often leads to criminality and can cause serious harm (Jones 2014; Paulhus 2014; Paulhus and Williams 2002). The difference between individuals scoring high on psychopathy and Machiavellianism might be thus hypothesized in their levels of intelligence (Cattell 1963). Although the meta-analysis of O'Boyle et al. (2013) suggested that there are no associations between Dark Triad traits and crystallized intelligence, some scholars argued that the associations with fluid intelligence are different (Bereczkei 2018), Machiavellianism being positively related and psychopathy negatively related to intelligence (Kowalski et al. 2018). Finally, a person scoring high on narcissism can be described as having predisposition and willingness to being simultaneously grandiose, entitled and dominant (Emmons 1987). However, narcissism seems to be different from

Machiavellianism and psychopathy (Rogoza and Ciecuch 2017, 2018). According to the Narcissistic Admiration and Rivalry Concept (Back et al. 2013; Back 2018) agentic and antagonistic components of narcissism can be differentiated, leading to an understanding of convergence to and divergence from the Dark Triad. Empirical studies reveal that whereas the antagonistic component of narcissism is closely related to Machiavellianism and psychopathy, the agentic component is not (Rogoza et al. 2019). Research on the Dark Triad is primarily focused on the agentic aspects of narcissism, with its antagonistic expressions covered only to a limited extent (Back 2018; Rogoza et al. 2019).

Although research on the Dark Triad is flourishing (Furnham et al. 2013), it cannot be determined unambiguously whether the three traits are actually separate constructs: existing research suggests contradictory conclusions (e.g., Jones and Paulhus 2017; Miller et al. 2017). Some scholars have demonstrated that the three traits are moderately intercorrelated (Jakobwitz and Egan 2006; Lee and Ashton 2005; Paulhus and Williams 2002); others indicate that Machiavellianism and psychopathy manifest almost identical empirical profiles whereas narcissism demonstrates differential relations (McHoskey et al. 1998; Miller et al. 2017; O'Boyle et al. 2015; Rogoza and Ciecuch 2018; Rogoza et al. 2019; Vize et al. 2016); which moved beyond self-report (e.g., using experimental tasks; Jones 2014; Jones and Paulhus 2017; Kowalski et al. 2018).

Moreover, the literature is not clear about the current status of the Dark Triad – whether there is only a dark core of personality (Moshagen et al. 2018), whether Machiavellianism and psychopathy are redundant (O'Boyle et al. 2015) and what the role of narcissism in the Dark Triad is (Rogoza et al. 2019). More research is therefore needed to increase our understanding of these dark traits of personality characteristics. Temperamental traits may be seen as an initial basis for disposition and personality development (Rothbart et al. 2000), including Dark Triad traits; therefore, studying their relations may serve as a step towards better understanding of the underlying foundations of dark traits of personality.

Meta-Analytic Methods

Literature Search

A few studies examining the relationship between the Dark Triad and the BIS/BAS suggest that the temperamental foundation of dark traits of personality lies in a low BIS and a high BAS (Sellbom and Glenn 2015). To scrutinize this issue in greater detail, we conducted a meta-analysis using major electronic databases (such as PsycINFO, PsychArticles and Google Scholar) to locate the articles for inclusion. Keywords “Dark Triad”, “narcissism”, “Machiavellianism”,

Table 1 The Zero-Order Correlation Estimates Between the Dark Triad Traits and the BIS/BAS

Study	N	Participants	Methods	BIS	BAS	Drive	Reward	Fun	BIS/BAS α
Narcissism									
Unpublished data gathered by the authors of the paper	237	High school students	BIS/BAS Scale	-.15	.43	.29	.14	.10	.70 .77 .67 .61 .64
Ackerman et al. (2011)	353	College students	SD3						
			BIS/BAS Scale	-.26	.33	.40	.11	.23	N/A
			NPI						
Foster et al. (2009)	109	Students	BIS/BAS Scale	.58	-.21				.77 .86
			NPI						N/A N/A
									N/A
^a Collison et al. (2018)	280	Recruited via Amazon’s Mechanical Turk	BIS/BAS Scale	-.21	.24	.38	-.05	.35	.83 N/A
			SD3						.77 .77 .65
			DTDD						
			NPI						
Fulford et al. (2008)	233	Students	BIS/BAS Scale	-.27	.20	.42	-.01	.19	.78 .79 .72 .68 .78
			NPI						
Foster and Brennan (2011)	1319	Students	BIS/BAS Scale	-.28	.44				N/A
			NPI						
Hart et al. (2017)	303	Undergraduate students of psychology	BIS/BAS Scale	-.29	.39				.76 .82
			NPI						N/A N/A
									N/A
Foster and Trimm (2008)	917	University students	BIS/BAS Scale	-.28	.34				.69 .74
			NPI						N/A N/A
									N/A
Jonason and Jackson (2016)	300	Students, Facebook users	BIS/BAS Scale	.23	.12	.21	.06	.09	.83 N/A
			DTDD						.89 .83 .83
Mowlaie et al. (2016)	200	University students	BIS/BAS Scale	-.33	.45				N/A
			PNI-G						
Neria et al. (2016)	319	Recruited via Amazon’s Mechanical Turk	BIS/BAS Scale	-.23	.17	.34	.01	.16	.82 N/A
			NPI						.80 .79 .74
Roose et al. (2011)	455	High school students	BIS/BAS Scale	-.13	.26	.36	.07	.36	N/A
			APSD						
Miller et al. (2009)	200	Students	BIS/BAS Scale	-.30	.23	.14	.36	.20	N/A N/A
			NPI						.92 N/A
									.80
Spencer et al. (2017)	854	University students	BIS/BAS Scale	-.28	.46				N/A
			FFNI-G						
	258	University students	BIS/BAS Scale	-.07	.36				N/A
			NGS						
Stenanson and Vernon (2016)	242	University students	BIS/BAS Scale	-.07	.38				.75 N/A
			SD3						.77 .72 .76
Hermann et al. (2015)	206	University students	BIS/BAS Scale	-.29	.47				.73 .74
			NPI						N/A N/A
									N/A
	183	University students	BIS/BAS Scale	-.22	.35				.76 .75
			NPI						N/A N/A
									N/A
Psychopathy									
Unpublished data gathered by the authors of the paper	237	High school students	BIS/BAS Scale	-.21	.40	.33	-.22	.36	.70 .77 .67 .61 .64
			SD3						
^a Collison et al. (2018)	280	Mechanical Turk Workers	BIS/BAS Scale	-.13	.15	.25	-.12	.31	.83 N/A .77 .77 .65
			SD3						
			DTDD						
			SRP-III						
Uzieblo et al. (2007)	431 + 165	Undergraduates + inmates	BIS/BAS Scale	-.24	.38	.30	.16	.46	.79 N/A
			PPI						N/A N/A
									.59
Jonason and Jackson (2016)	300	Students, Facebook users	BIS/BAS Scale	-.13	.01	.09	-.15	.08	.83 N/A
			DTDD						.89 .83 .83
	319		BIS/BAS Scale	-.18	.06	.14	-.19	.23	.82 N/A

Table 1 (continued)

Study	<i>N</i>	Participants	Methods	BIS	BAS	Drive	Reward	Fun	BIS/BAS α
Neria et al. (2016)		Recruited via Amazon's Mechanical Turk	SRP						.80 .79 .74
Roose et al. (2011)	455	High school students	BIS/BAS Scale APSD	-.32	.29	.40	-.01	.47	N/A
	375	Technical education school students	BIS/BAS Scale YPI	-.31	.31	.43	.03	.46	N/A
Sellbom and Glenn (2015)	972	Prison inmates	BIS/BAS Scale PPI	-.42	.20				N/A
Stenanson and Vernon (2016)	242	University students	BIS/BAS Scale SD3	-.26	.31				.75 N/A .77 .72 .76
Machiavellianism									
Unpublished data gathered by the authors of the paper	237	High school students	BIS/BAS Scale SD3	-.16	.42	.28	.08	.16	.70 .77 .67 .61 .64
^a Collison et al. (2018)	280	Mechanical Turk Workers	BIS/BAS Scale SD3 DTDD MACH-IV FFMI	-.08		.22	-.11	.16	.83 N/A .77 .77 .65
Jonason and Jackson (2016)	300	Students, Facebook users	BIS/BAS Scale DTDD	-.01	.08	.17	-.02	.08	.83 N/A .89 .83 .83
Neria et al. (2016)	319	Recruited via Amazon's Mechanical Turk	BIS/BAS Scale MACH-IV	-.03	-.04	-.03	-.11	.01	.82 N/A .80 .79 .74
Stenanson and Vernon (2016)	242	University students	BIS/BAS Scale SD3	.04	.31				.75 N/A .77 .72 .76

The BIS/BAS reliability is listed as follows: BIS|BAS|Drive|Reward|Fun; N/A = The reliability estimate was not reported. SD3 – Short Dark Triad; NPI – Narcissistic Personality Inventory; DTDD – Dirty Dozen; PNI-G – Pathological Narcissism Inventory-Grandiose Narcissism; APSD – Antisocial Process Screening Device; FFNI-G – Five Factor Narcissism Inventory-Grandiose Narcissism; NGS – Grandiose Narcissism Scale; SRP-III – Self-Report Psychopathy Scale Version III; PPI – Psychopathic Personality Inventory; YPI – Youth Psychopathic Traits Inventory; MACH-IV – Machiavellianism Scale; FFMI – Five Factor Machiavellianism Inventory

^a Correlations are given for the average of narcissism/psychopathy/Machiavellianism

“psychopathy”, “BIS” and “BAS” were used to search for published studies on the relations between the Dark Triad traits and the BIS/BAS. Although the literature search revealed some papers on vulnerable narcissism, we only included those on grandiose narcissism because of its involvement within the Dark Triad (Paulhus and Williams 2002). Additionally, the reference sections of the articles found by the initial search were scanned to see if further articles could be located in this fashion. The study search was finalized in December 2018 with 24 possible studies, including one unpublished article (which was not used in the meta-analysis). No studies published in so-called ‘predatory journals’ were included in the meta-analysis.

Inclusion and Exclusion Criteria

To be included in the systematic review, a study needed to report empirical research and examine the relations between a Dark Triad trait or facet and a BIS/BAS trait – we found 24 potentially relevant studies that reported zero-order

correlations. We excluded six studies that used a multidimensional measure of the Dark Triad traits but did not provide a correlation for the domain score. We did not place any restrictions on the type of sample used in a study (e.g., clinical, college, online, etc.). If an article reported relevant relations using several samples, each sample was treated as an independent sample. If an article reported multiple correlations, only one, obtained by using the most popular measure of the trait, was chosen for the meta-analysis (see Table 1). For example, if an article reported a few measures of narcissism, we took the correlation reported for NPI, as it is a questionnaire most commonly used in other studies. Finally, 18 articles were selected and included within the meta-analysis, providing a total of 21 independent samples. Studies used in the meta-analysis that are not cited in the text are marked by * in the reference list.

Meta-Analysis Procedure

We used Hedges and Olkin's (1985) method for calculating the weighted summary correlation coefficient under the fixed-

Table 2 Associations Between BIS/BAS to the Dark Triad Traits

Variables	<i>k</i>	<i>N</i>	<i>g</i>	95%CI	<i>Q</i>
Narcissism					
BIS	18	6968	-.22	-.25, -.20	-18.79*
BAS	18	6968	.35	.33, .37	30.62*
Drive	8	2377	.33	.29, .37	16.60*
Reward	8	2377	.08	.04, .12	3.76*
Fun	8	2377	.23	.19, .26	11.11*
Psychopathy					
BIS	9	3776	-.28	-.31, -.25	-17.87*
BAS	9	3776	.24	.21, .27	15.15*
Drive	7	2562	.29	.26, .33	15.24
Reward	7	2562	-.04	-.07, .00	-1.77
Fun	7	2562	.37	.34, .40	19.55*
Machiavellianism					
BIS	5	1378	-.05	-.10, .01	-1.70
BAS	5	1378	.16	.11, .21	5.89*
Drive	4	1136	.15	.09, .21	5.09*
Reward	4	1136	-.05	-.11, .01	-1.57
Fun	4	1136	.10	.04, .16	3.27*

k = number of effect sizes; *g* = the inverse variance weighted mean observed effect size estimate (Hedge's *g*); 95% CI = lower and upper bounds of the 95%CI for *d*; *Q* = χ^2 test for the homogeneity of true correlations across studies; * *p* < .05

effects model, using a Fisher Z transformation of the correlation coefficients (DerSimonian and Laird 1986). To investigate whether there was a significant variation across studies in the estimates of effect size, the *Q* statistic was calculated as a summed squared deviations of each study effect estimate from the overall effect estimate, weighting the contribution of each study by its inverse variance (Huedo-Medina

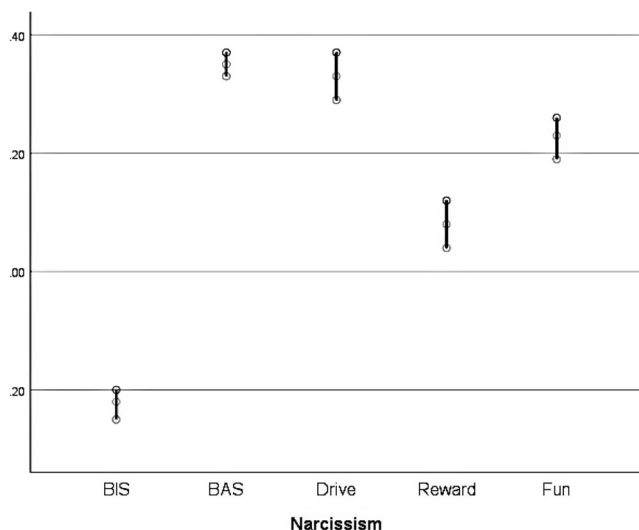


Fig. 1 The results of meta-analysis for narcissism (estimates with confidence intervals)

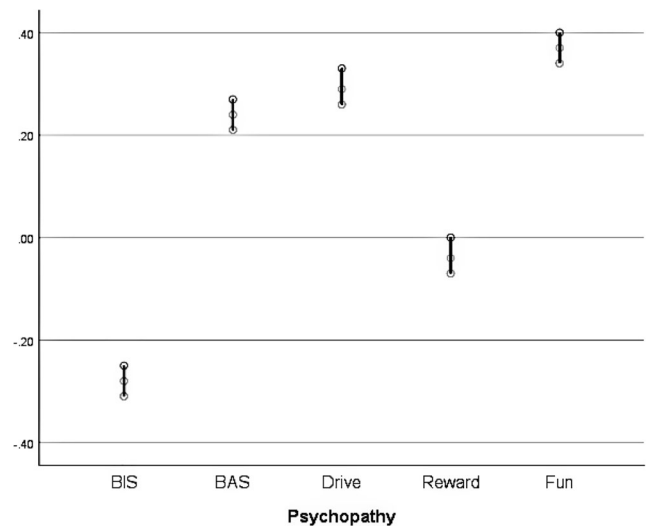


Fig. 2 The results of meta-analysis for psychopathy (estimates with confidence intervals)

et al. 2006). Significant values of the *Q* statistic (which follows chi-square distribution with *k* - 1 degrees of freedom, where *k* reflects the number of studies) indicate non-random variation in effect size estimates across the (homogenous) samples, which allows to assume that the estimated effect sizes only differ by sampling error. All of the results are presented, along with 95% confidence intervals.

Results

Zero-order correlation estimates between the Dark Triad traits and the BIS/BAS, a sample description and the measures used are presented in Table 1, and the results of the meta-analysis of these estimates are presented in Table 2. Moreover, three

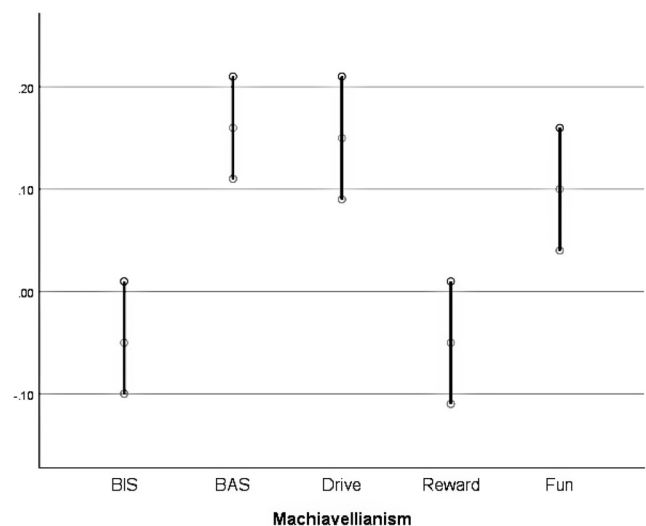


Fig. 3 The results of meta-analysis for Machiavellianism (estimates with confidence intervals)

forest plots of the meta-analytic results (Figures 1, 2, and 3) were prepared – one for each trait of the Dark Triad of personality.

The BIS/BAS were most frequently analysed in the context of narcissism (number of studies $k = 16$), and the fewest studies ($k = 5$) reported their relations to Machiavellianism. The subjects examined most often were university students. In all of the analysed studies the participants were administered the BIS/BAS (Carver and White 1994); to measure the Dark Triad they were usually administered the Narcissistic Personality Inventory (NPI; Raskin and Hall 1979) for narcissism, the Psychopathic Personality Inventory (PPI; Lilienfeld and Andrews 1996) for psychopathy and the MACH-IV (Christie and Geis 1970) for Machiavellianism. Estimates obtained from the meta-analysis suggest that narcissism and psychopathy are negatively related to the BIS whereas Machiavellianism is unrelated. Subsequently, the BAS relations with the Dark Triad were all significant and positive: the effect size was strongest for narcissism and weakest for Machiavellianism. With respect to the BAS components, effect sizes of BAS-Drive were all significant and positive (strongest for narcissism and weakest for Machiavellianism); BAS-Reward turned out to be virtually unrelated to the Dark Triad (with only one significant but low result for narcissism); and BAS-Fun was positively related to all traits (with the strongest relation to psychopathy and the weakest to Machiavellianism).

Discussion

According to the results of the meta-analysis, the claim that the Dark Triad may generally be described in terms of a low BIS and a high BAS (Sellbom and Glenn 2015) was partially confirmed. Nevertheless, the role of the BAS seems to be more important in explaining the Dark Triad traits. Narcissism seems to be the most connected to the BIS/BAS amongst the Dark Triad traits, which is in line with theoretical models of narcissism outlining the role of temperamental traits in the explanation of narcissistic trait of personality (Krizan and Herlache 2018). Approach orientation is also central to Campbell et al. (2006) agentic model of narcissism, which is viewed by the dynamic self-regulatory processing model as an important concept for understanding narcissism (Morf and Rhodewalt 2001). In this vein, persons high on the narcissism scale appear to have a strong motivation towards being rewarded and simultaneously being weakly motivated by punishment (Foster and Trimm 2008; Foster et al. 2009).

The only dimension of the BAS in which psychopathy gained higher results than narcissism was Fun Seeking:

reflecting a tendency both to seek out new potentially rewarding experience and to act on the spur of the moment. Narcissism and psychopathy have both been linked to impulsivity (Jones and Paulhus 2011; Vazire and Funder 2006); people with a high level of narcissism tend to focus overly on positive outcomes and highly care about their self-promotion, whereas individuals with a high level of psychopathy tend to act irresponsibly and aggressively, ignoring the outcomes and experiencing diminished aversive conditioning (Flor et al. 2002) and reduced fear-potentiated startle (Patrick 1994), which might explain the observed relations with Fun Seeking.

Contrary to the observed relations between narcissism/psychopathy and temperamental traits, Machiavellianism turned out to be the least related to the BIS/BAS out of the Dark Triad traits. First of all, Machiavellianism is less strongly associated with impulsivity than narcissism or psychopathy (Jones and Paulhus 2011). Moreover, genetic investigations of the Dark Triad traits suggested that, whereas narcissism and psychopathy were largely heritable, Machiavellianism was inherited to a lesser extent. When environmental effects were considered, these explained most of the variance in Machiavellianism (Campbell et al. 2009). Thus, one might hypothesize that, among the Dark Triad traits, Machiavellianism is least related to the biologically rooted temperamental foundations and might be developed in response to environmental effects.

The results obtained in the meta-analysis can also be interpreted in terms of the Five-Factor Model of personality (McCrae and Costa 1997). Existing meta-analyses and behavioural genetic studies reveal that psychopathy and Machiavellianism are both primarily related to low agreeableness, whereas narcissism is related to higher extraversion and partially to low agreeableness (Muris et al. 2017; O’Boyle et al. 2015; Rogoza 2018; Vernon et al. 2008). The BIS is primarily related to high neuroticism and then to high agreeableness (Donnellan et al. 2006; Keiser and Ross 2011), whereas the BAS is mostly related to high extraversion. With regard to the BAS facets, Reward Responsiveness demonstrated least association with the personality traits, whereas Fun Seeking and Drive were negatively associated with agreeableness (Segarra et al. 2014; Smits & Boeck 2006). It is not surprising, therefore, that the Dark Triad traits were all related negatively to the BIS (due to relation with low agreeableness) and positively to the BAS (due to relation with high extraversion and low agreeableness). Moreover, the current results explain why Reward Responsiveness was least related to the Dark Triad traits – because it is also unrelated to the basic personality traits. In summary, the current findings fit within the broader description of personality provided by the Five-Factor Model.

Limitations

Our meta-analysis is not free from limitations. As some researchers mentioned (Krizan and Herlache 2018; Patrick et al. 2009), the Dark Triad traits are multidimensional constructs but in our study we analysed only the domain scores of the questionnaires, thus the conclusions can only be applied to an overall view of the temperamental foundations of the Dark Triad traits. Our findings are also mostly limited to the population of Western undergraduate students. Furthermore, the questionnaires used to measure the Dark Triad traits were different in the majority of the research. The fact that the meta-analysis was based on self-report measures might be treated as another limitation due to the discrepancy in how narcissistic individuals see themselves compared to their true scores (Zajenkowski and Czarna 2015).

Conclusions

To summarize, the results of the meta-analysis presented in this paper systematize the knowledge on the temperamental foundations of dark traits of personality. Although the Dark Triad traits were generally described in terms of a high-approach low-avoidance temperament (Sellbom and Glenn 2015), our results confirmed this assumption only partially. Narcissism and psychopathy indeed reflected such an assumption but Machiavellianism had very little relation to temperamental traits. With regard to the facets of the BAS, BAS-Reward turned out to be the least related to the Dark Triad traits whereas BAS-Drive was the most strongly related.

Funding Information This study was funded by Polish National Science Center (grant number 2015/19/N/HS6/00685).

Compliance with Ethical Standards

Conflict of Interest Katarzyna A. Włodarska declares that she has no conflict of interest. Emilia Zyskowska declares that she has no conflict of interest. Martyna K. Terebus declares that she has no conflict of interest. Radosław Rogoza declares that he has no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all participants included in the study.

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give

appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

- * Ackerman, R. A., Witt, E. A., Donnellan, M. B., Trzesniewski, K. H., Robins, R. W., & Kashy, D. A. (2011). What does the narcissistic personality inventory really measure? *Assessment, 18*, 67–87. <https://doi.org/10.1177/1073191110382845>.
- * Włodarska, K. A., Zyskowska, E., Terebus, M. K., Rogoza, R., (2018). Born to be evil? A meta-analysis of the relations between the Dark Triad traits and temperament. Unpublished data collected by the authors (data can be downloaded at: https://osf.io/3zw97/?view_only=2a6fd6b61b184be5902cbb8bb82bc2).
- Back, M. D. (2018). The narcissistic admiration and rivalry concept. In A. D. Hermann, A. B. Brunnel, & J. D. Foster (Eds.), *Handbook of trait narcissism. Key advances, research methods, and controversies* (pp. 57–67). Cham: Springer International Publishing AG. https://doi.org/10.1007/978-3-319-92171-6_6.
- 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>.
- Bereczkei, T. (2018). Machiavellian intelligence hypothesis revisited: What evolved cognitive and social skills may underlie human manipulation. *Evolutionary Behavioral Sciences, 12*, 32–51. <https://doi.org/10.1037/ebs0000096>.
- Campbell, W. K., Brunell, A. B., & Finkel, E. J. (2006). Narcissism, interpersonal self-regulation, and romantic relationships: An agency model approach. In K. D. Vohs & E. J. Finkel (Eds.), *Self and relationships: Connecting intrapersonal and interpersonal processes* (pp. 57–83). New York: Guilford Press.
- Campbell, J., Schermer, J. A., Villani, V. C., Nguyen, B., Vickers, L., & Vernon, P. A. (2009). A behavioral genetic study of the dark triad of personality and moral development. *Twin Research and Human Genetics, 12*, 132–136. <https://doi.org/10.1375/twin.12.2.132>.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67*, 319–333. <https://doi.org/10.1037/0022-3514.67.2.319>.
- Cattell, R. B. (1963). Theory of fluid and crystallized intelligence: A critical experiment. *Journal of Educational Psychology, 54*, 1–22. <https://doi.org/10.1037/h0046743>.
- Christie, R., & Geis, F. (1970). *Studies in Machiavellianism*. New York, NY: Academic Press.
- Cogswell, A., Alloy, L. B., van Dulmen, M. H. M., & Fresco, D. M. (2006). A psychometric evaluation of behavioral inhibition and approach self-report measures. *Personality and Individual Differences, 40*, 1649–1658. <https://doi.org/10.1016/j.paid.2005.12.008>.
- 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. <https://doi.org/10.1037/pas0000637>.
- Cooper, A., Gomez, R., & Aucote, H. (2007). The Behavioural inhibition system and Behavioural approach system (BIS/BAS) scales: Measurement and structural invariance across adults and adolescents. *Personality and Individual Differences, 43*, 295–305. <https://doi.org/10.1016/j.paid.2006.11.023>.
- Corr, P. J. (2004). Reinforcement sensitivity theory and personality. *Neuroscience and Biobehavioral Reviews, 28*, 317–332. <https://doi.org/10.1017/CBO9780511819384.006>.

- Corr, P. J., & McNaughton, N. (2008). Reinforcement sensitivity theory and personality. In P. J. Corr (Ed.), *The reinforcement sensitivity theory of personality* (pp. 155–187). New York, NY: Cambridge University Press.
- DerSimonian, R., & Laird, N. (1986). Meta-analysis in clinical trials. *Controlled Clinical Trials*, 7, 177–188. [https://doi.org/10.1016/0197-2456\(86\)90046-2](https://doi.org/10.1016/0197-2456(86)90046-2).
- Donnellan, M. B., Oswald, F. L., Baird, B. M., & Lucas, R. E. (2006). The mini-IPIP scales: Tiny-yet-effective measures of the big five factors of personality. *Psychological Assessment*, 18(2), 192–203. <https://doi.org/10.1037/1040-3590.18.2.192>.
- Emmons, R. A. (1987). Narcissism: Theory and measurement. *Journal of Personality and Social Psychology*, 52, 11–17. <https://doi.org/10.1037/0022-3514.52.1.11>.
- Flor, H., Birbaumer, N., Hermann, C., Ziegler, S., & Patrick, C. J. (2002). Aversive Pavlovian conditioning in psychopaths: Peripheral and central correlates. *Psychophysiology*, 39, 505–518. <https://doi.org/10.1111/1469-8986.3940505>.
- Foster, J. D., & Brennan, J. C. (2011). Narcissism, the agency model, and approach-avoidance motivation. In W. K. Campbell & J. D. Miller (Eds.), *The handbook of narcissism and narcissistic personality disorder: Theoretical approaches, empirical findings, and treatments* (pp. 89–100). Hoboken, NJ: John Wiley & Sons Inc..
- Foster, J. D., Misra, T. A., & Reidy, D. E. (2009). Narcissists are approach-oriented toward their money and their friends. *Journal of Research in Personality*, 43, 764–769. <https://doi.org/10.1016/j.jrp.2009.05.005>.
- Foster, J. D., & Trimm, R. F. (2008). On being eager and uninhibited: Narcissism and approach-avoidance motivation. *Personality and Social Psychology Bulletin*, 34, 1004–1017. <https://doi.org/10.1177/0146167208316688>.
- Fulford, D., Johnson, S. L., & Carver, C. S. (2008). Commonalities and differences in characteristics of persons at risk for narcissism and mania. *Journal of Research in Personality*, 42, 1427–1438. <https://doi.org/10.1016/j.jrp.2008.06.002>.
- 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>.
- Gray, J. A. (1987). Perspectives on anxiety and impulsivity: A commentary. *Journal of Research in Personality*, 21, 493–509. [https://doi.org/10.1016/0092-6566\(87\)90036-5](https://doi.org/10.1016/0092-6566(87)90036-5).
- Hart, W., Adams, J., Burton, K. A., & Tortoriello, G. K. (2017). Narcissism and self-presentation: Profiling grandiose and vulnerable Narcissists' self-presentation tactic use. *Personality and Individual Differences*, 104, 48–57. <https://doi.org/10.1016/j.paid.2016.06.062>.
- Hermann, A. D., Teutemacher, A. M., & Lehtman, M. J. (2015). Revisiting the unmitigated approach model of narcissism: Replication and extension. *Journal of Research in Personality*, 55, 41–45. <https://doi.org/10.1016/j.jrp.2014.12.002>.
- Hedges, L., & Olkin, I. (1985). *Statistical models for meta-analysis*. New York, NY: Academic Press.
- Heubeck, B. G., Wilkinson, R. B., & Cologon, J. (1998). A second look at Carver and White's (1994) BIS/BAS scales. *Personality and Individual Differences*, 25, 785–800. <https://doi.org/10.1016/j.paid.2009.05.003>.
- Huedo-Medina, T. B., Sánchez-Meca, J., Marín-Martínez, F., & Botella, J. (2006). Assessing heterogeneity in meta-analysis: Q statistic or I² index? *Psychological Methods*, 11(2), 193–206.
- Jakobwitz, S., & Egan, V. (2006). The dark triad and normal personality traits. *Personality and Individual Differences*, 40, 331–339. <https://doi.org/10.1016/j.paid.2005.07.006>.
- Johnson, S. L., Tumer, J., & Iwata, N. (2003). BIS/BAS levels and psychiatric disorder: An epidemiological study. *Journal of Psychopathology and Behavioral Assessment*, 25, 25–36. <https://doi.org/10.1023/A:1022247919288>.
- Jonason, P. K., & Jackson, C. J. (2016). The dark triad traits through the lens of reinforcement sensitivity theory. *Personality and Individual Differences*, 90, 273–277. <https://doi.org/10.1016/j.paid.2015.11.023>.
- Jones, D. N. (2014). Risk in the face of retribution: Psychopathic individuals persist in financial misbehavior among the dark triad. *Personality and Individual Differences*, 57, 109–113. <https://doi.org/10.1016/j.paid.2014.01.030>.
- Jones, D. N., & Paulhus, D. L. (2009). Machiavellianism. In M. R. Leary & R. H. Hoyle (Eds.), *Individual differences in social behavior* (pp. 93–108). New York, NY: Guilford.
- Jones, D. N., & Paulhus, D. L. (2011). The role of impulsivity in the dark triad of personality. *Personality and Individual Differences*, 51, 679–682. <https://doi.org/10.1016/j.paid.2011.04.011>.
- 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>.
- Jorm, A. F., Christensen, H., Henderson, A. S., Jacomb, P. A., Korten, A. E., & Rodgers, B. (1999). Using the BIS/ BAS scales to measure behavioural inhibition and behavioural activation: Factor structure, validity and norms in a large community sample. *Personality and Individual Differences*, 26, 49–58. [https://doi.org/10.1016/S0191-8869\(98\)00143-3](https://doi.org/10.1016/S0191-8869(98)00143-3).
- Keiser, H. N., & Ross, S. R. (2011). Carver and whites' BIS/FFFS/BAS scales and domains and facets of the five factor model of personality. *Personality and Individual Differences*, 51, 39–44. <https://doi.org/10.1016/j.paid.2011.03.007>.
- 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>.
- Krizan, Z., & Herlache, A. D. (2018). The narcissism spectrum model: A synthetic view of narcissistic personality. *Personality and Social Psychology Review*, 22, 3–31. <https://doi.org/10.1177/1088868316685018>.
- Lee, K., & Ashton, M. C. (2005). Psychopathy, Machiavellianism, and narcissism in the five-factor model and the HEXACO model of personality structure. *Personality and Individual Differences*, 38, 1571–1582. <https://doi.org/10.1016/j.paid.2004.09.016>.
- Leone, L., Perugini, M., Bagozzi, R. P., Pierro, A., & Mannetti, L. (2001). Construct validity and generalizability of the Carver–White behavioural inhibition system/behavioural activation system scales. *European Journal of Personality*, 15, 373–390. <https://doi.org/10.1002/per.415>.
- Lilienfeld, S. O., & Andrews, B. P. (1996). Development and preliminary validation of a self-report measure of psychopathic personality traits in noncriminal populations. *Journal of Personality Assessment*, 66, 488–524. https://doi.org/10.1207/s15327752jpa6603_3.
- McCrae, R. R., & Costa, P. T. (1997). Personality trait structure as a human universal. *American Psychologist*, 52, 509–516. <https://doi.org/10.1037/0003-066X.52.5.509>.
- McHoskey, J. W., Worzel, W., & Szyarto, C. (1998). Machiavellianism and psychopathy. *Journal of Personality and Social Psychology*, 74, 192–210. <https://doi.org/10.1037/0022-3514.74.1.192>.
- Miller, J. D., Campbell, W. K., Young, D. L., Lakey, C. E., Reidy, D. E., Zeichner, A., & Goodie, A. S. (2009). Examining the relations among narcissism, impulsivity, and self-defeating behaviors. *Journal of Personality*, 77, 761–794. <https://doi.org/10.1111/j.1467-6494.2009.00564.x>.
- 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. doi:<https://doi.org/10.1111/jopy.12251>.
- Morf, C. C., & Rhodewalt, F. (2001). Unraveling the paradoxes of narcissism: A dynamic self-regulatory processing model.

- Psychological Inquiry*, 12, 177–196. https://doi.org/10.1207/S15327965PLI1204_1.
- Moshagen, M., Hilbig, B. E., & Ingo, Z. (2018). The dark core of personality. *Psychological Review*, 125, 656–688. <https://doi.org/10.1037/rev0000111>.
- Mowlai, M., Abolghasemi, A., & Aghababaei, A. (2016). Pathological narcissism, brain behavioral systems and tendency to substance abuse: The mediating role of self-control. *Personality and Individual Differences*, 88, 247–250. <https://doi.org/10.1016/j.paid.2015.09.019>.
- Muris, P., Merckelbach, H., Otgaar, H., & Meijer, E. (2017). The malevolent side of human nature: A meta-analysis and critical review of the literature on the dark triad (narcissism, Machiavellianism, and psychopathy). *Perspectives on Psychological Science*, 12, 183–204. <https://doi.org/10.1177/17456916166666070>.
- Neria, A. L., Vizcaino, M., & Jones, D. N. (2016). Approach/avoidance tendencies in dark personalities. *Personality and Individual Differences*, 101, 264–269. <https://doi.org/10.1016/j.paid.2016.05.054>.
- O'Boyle, E. H., Forsyth, D. R., Banks, G. C., & Story, P. A. (2013). A meta-analytic review of the dark triad–intelligence connection. *Journal of Research in Personality*, 47, 789–794. <https://doi.org/10.1016/j.jrp.2013.08.001>.
- O'Boyle, E. H., Forsyth, D., Banks, G. C., Story, P. A., & White, C. D. (2015). A meta-analytic test of redundancy and relative importance of the dark triad and five-factor model of personality. *Journal of Personality*, 83, 644–664. <https://doi.org/10.1111/jopy.12126>.
- 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).
- Patrick, C. J. (1994). Emotion and psychopathy: Startling new insights. *Psychophysiology*, 31, 319–330. <https://doi.org/10.1111/j.1469-8986.1994.tb02440.x>.
- Patrick, C. J., Fowles, D. C., & Krueger, R. F. (2009). Triarchic conceptualization of psychopathy: Developmental origins of disinhibition, boldness, and meanness. *Development and Psychopathology*, 21, 913–938. <https://doi.org/10.1017/S0954579409000492>.
- Raskin, R. N., & Hall, C. S. (1979). A narcissistic personality inventory. *Psychological Reports*, 45, 590. <https://doi.org/10.2466/pr0.1979.45.2.590>.
- Rogoza, R. (2018). Narcissist unmasked. Looking for the narcissistic decision-making mechanism: a contribution from the Big Five. *Social Psychological Bulletin*, 13, e26623. <https://doi.org/10.5964/spb.v13i2.26623>.
- Rogoza, R., & Cieciuch, J. (2017). Structural investigation of the short dark triad questionnaire in polish population. *Current Psychology. Advance online publication*. <https://doi.org/10.1007/s12144-017-9653-1>.
- Rogoza, R., & Cieciuch, J. (2018). Dark triad traits and their structure: An empirical approach. *Current Psychology. Advance online publication*. <https://doi.org/10.1007/s12144-018-9834-6>.
- Rogoza, R., Kowalski, C. M., & Schermer, J. A. (2019). The dark triad traits within the framework of the Circumplex model of personality Metatraits. *Journal of Individual Differences*. <https://doi.org/10.1027/1614-0001/a000289>.
- Roose, A., Bijttebier, P., Claes, L., & Lilienfeld, S. O. (2011). Psychopathic traits in adolescence: Associations with the revised reinforcement sensitivity theory system. *Personality and Individual Difference*, 50, 201–205. <https://doi.org/10.1016/j.paid.2010.09.028>.
- Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology*, 78, 122–135. <https://doi.org/10.1037/0022-3514.78.1.122>.
- Ross, S. R., Benning, S. D., Patrick, C. J., Thompson, A., & Thurston, A. (2009). Factors of the psychopathic personality inventory: Criterion-related validity and relationship to the BIS/BAS and five-factor models of personality. *Assessment*, 16, 71–87. <https://doi.org/10.1177/1073191108322207>.
- Ross, S. R., Millis, S. R., Bonebright, T. L., & Bailey, S. E. (2002). Confirmatory factor analysis of the behavioral inhibition and activation scales. *Personality and Individual Differences*, 33, 861–865. [https://doi.org/10.1016/S0191-8869\(01\)00196-9](https://doi.org/10.1016/S0191-8869(01)00196-9).
- Segarra, P., Poy, R., López, R., & Moltó, J. (2014). Characterizing Carver and White's BIS/BAS subscales using the five factor model of personality. *Personality and Individual Differences*, 61–62, 18–23. <https://doi.org/10.1016/j.paid.2013.12.027>.
- Sellbom, M., & Glenn, A. L. (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.
- Shiner, R. L., Buss, K. A., McClowry, S. G., Putnam, S. P., Saudino, K. J., & Zentner, M. (2012). What is temperament now? Assessing Progress temperament research on the twenty-fifth anniversary of goldsmith et al. *Child Development Perspectives*, 6, 436–444. <https://doi.org/10.1111/j.1750-8606.2012.00254.x>.
- Smits, D.J.N., & Boeck, P.D. (2006). From BIS/BAS to the big Five. *European Journal of Personality*, 20, 255–270. <https://doi.org/10.1002/per.583>.
- Spencer, C. C., Foster, J. D., & Bedwell, J. S. (2017). Structural relationships among the revised reinforcement sensitivity theory and grandiose and vulnerable narcissism. *Journal of Personality Disorders*, 31, 318–321. https://doi.org/10.1521/pedi_2017_31_318.
- Stenanson, L., & Vernon, P. (2016). The dark triad, reinforcement sensitivity and substance use. *Personality and Individual Differences*, 94, 59–63. <https://doi.org/10.1016/j.paid.2016.01.010>.
- Uzieblo, K., Verschuere, B., & Crombez, G. (2007). The psychopathic personality inventory: Construct validity of the two-factor structure. *Personality and Individual Differences*, 43, 657–667. <https://doi.org/10.1016/j.paid.2007.01.008>.
- Vazire, S., & Funder, D. C. (2006). Impulsivity and the self-defeating behavior of narcissists. *Personality and Social Psychology Review*, 10, 154–165. https://doi.org/10.1207/s15327957pspr1002_4.
- Vernon, P. A., Vilani, V. C., Vickers, L. C., & Harris, J. A. (2008). A behavioural genetic investigation of the dark triad and the big 5. *Personality and Individual Differences*, 44, 445–452. <https://doi.org/10.1016/j.paid.2007.09.007>.
- Vize, C. E., Lynam, D. R., Collision, K. L., & Miller, J. D. (2016). Differences among dark triad components: A meta-analytic investigation. *Personality Disorders: Theory, Research, and Treatment*, 9, 101–111. <https://doi.org/10.1037/per0000222>.
- Zajenkowski, M., & Czarna, A. Z. (2015). What makes narcissists unhappy? Subjectively assessed intelligence moderates the relationship between narcissism and psychological well-being. *Personality and Individual Differences*, 77, 50–54. <https://doi.org/10.1016/j.paid.2014.12.045>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.