

Behavioral inhibition, behavioral activation, and impulsivity in the Dark Triad¹

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Gray's Reinforcement Sensitivity Theory postulates that the behavioral inhibition system (BIS) is responsible for regulating anxiety and fear in response to external stimuli, while the behavioral activation system (BAS) is responsible for processing positive cues such as rewards. Dickman's model distinguishes dysfunctional impulsivity (DI), characterized by non-reflective decision-making, from functional impulsivity (FI), which reflects the propensity of making quick decisions when advantageous. The aim of this study is to investigate the potential of the BIS/BAS and DI/FI to explain the variance in the Dark Triad traits. The sample included 318 convenient-recruited participants ($M_{age} = 28.67$, $SD_{age} = 8.95$; 75.2% females) who completed the BIS/BAS scales (BIS, BAS Fun Seeking, BAS Reward Responsiveness, and BAS Drive), Dickman's Impulsivity Inventory and Short Dark Triad (Machiavellianism, narcissism, and psychopathy). BAS Reward Responsiveness and BAS Drive were significant predictors of Machiavellianism, which indicated that individuals high on this trait could be sensitive to positive reinforcement. BIS, BAS Fun Seeking, and DI were significant predictors of psychopathy, while BIS, all BAS scales, and FI were significant predictors of narcissism. These results suggest that poor inhibition, low impulse control, and a strong tendency to approach pleasure-oriented activities are the factors that significantly contribute to explaining the surface of psychopathy, and they could be seen as particularly important for maladaptive behavior. On the other hand, individuals with high narcissism may

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be sensitive to positive reinforcement, goal-oriented, and exhibit functional impulsivity, which allows them to capitalize on opportunities.

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Introduction

Behavioral inhibition and behavioral activation

Gray's Reinforcement Sensitivity Theory (Gray 1970, 1981), developed on the basis of Eysenck's theory of personality, subsumes two systems that underlie behavior: the behavioral inhibition system (BIS) and the behavioral activation system (BAS). According to the theory, BIS is responsible for sensitivity to punishment and avoidance motivation, and could be seen as the causal basis of *anxiety* (Gray, 1982). BIS is activated in the situations that require the avoidance of potentially threatening stimuli in order to prevent negative emotional experiences such as fear or anxiety. Contrary to BIS, BAS is responsible for appetitive (approach) motivation. According to Gray's theory, BAS is not related to punishment but rather sensitive to stimuli consistent with reward, and could be seen as the causal basis for *impulsivity*. Gray believed that anxiety (i.e., sensitivity to punishment) and impulsivity (i.e., sensitivity to reward) were more fundamental dimensions than Eysenck's extraversion and neuroticism. He argued that extraversion and neuroticism should be rotated by 30° to form the axes of BIS and BAS. That is, BIS should be placed between neuroticism and introversion (i.e., high anxiety), contrary to emotional stability and extraversion (i.e., low anxiety), while BAS should be placed between extraversion and neuroticism (i.e., high impulsivity) as opposed to introversion and emotional stability (i.e., low impulsivity). The third, the fight-flight system (FFS), was seen as responsible for controlling active avoidance ("fight") and escape behavior ("flight") in new and highly unpredictable situations where confrontation with the threat is inevitable (Gray, 1990). However, the FFS received much less attention, and it was not considered the basic system that underlies behavior in the way the BIS and BAS do since it was seen as responsible for the reactions to unconditioned aversive stimuli only. This system gained more attention in the revised Reinforcement Sensitivity Theory (Gray & McNaughton, 2000).

In the revised theory, the flight-flight system was renamed to the fight-flight-freeze system (FFFS) in order to include the "freezing" behavior observed in Blanchard's rodent studies (e.g., Blanchard et al., 1975). In addition, it was seen as the system that had a role in controlling responses to all aversive stimuli, not just the unconditioned ones (Gray & McNaughton, 2000). The revised theory also brought changes in understanding of the role of the other two systems that will be introduced briefly. The BIS is still

considered as the basis of anxiety, but is considered to be activated by all types of conflicts (approach-approach, avoidance-approach, and avoidance-avoidance), i.e., to have a role in risk analysis and to resolve the conflicts by inhibiting prepotent behavior. On the other hand, the BAS remained almost unchanged, although the “new role” included the responses to all, not only conditioned stimuli. In addition, the BAS is more likely to underlie extraversion rather than impulsivity (Smillie et al., 2006). Contrary to the original theory where BIS and BAS were seen as two independent systems, Corr (2002) proposed the hypothesis of joint subsystems activation, thus pointing out that BIS and BAS were likely to jointly influence behavior, while one of them might dominate only in certain circumstances (e.g., in the conditions of extreme appetitive or aversive stimulation). This hypothesis received some empirical support (e.g., Izadpanah et al., 2017). As the third one, the “velocity” hypothesis (Carver, 2004) emerged from the findings fitting neither the separate systems hypothesis nor the joint subsystems activation hypothesis. It argues that either approach or avoidance motivation could have positive or negative valence effects depending on the results of ongoing action. Naturally, this hypothesis also gained some empirical support (e.g., Krupić & Corr, 2014). Evidently, there is no consensus among scholars on the relationship between these systems. Moreover, advancing the theory under the influence of behavioral economics, Corr and McNaughton (2012) proposed five interactive systems (“sensitivities”): positive and negative evaluations (of gains and losses), attraction/approach (BAS), repulsion/avoidance (FFFS), and conflict resolution (BIS). Also, they proposed renaming the theory into the “Reinforcer Sensitivity Theory”.

Since it was introduced, the Reinforcement Sensitivity Theory has received much attention. For that reason, many attempts have been made to develop measures from the perspective of the original Gray’s theory (see MacAndrew & Steele, 1991; Wilson et al., 1989) or the revised theory (see Corr & Cooper, 2016; Jackson, 2009; Smederevac et al., 2014), but none of them was as influential as Carver and White’s (1994) BIS/BAS scales. One of the main reasons for this phenomenon lies in the psychometric shortcomings of the instruments based on the revised theory, mainly in the area of the FFFS (see Krupić et al., 2016). Carver and White’s (1994) operationalization proposes the existence of the BIS and three subscales of BAS, namely Fun Seeking, Reward Responsiveness, and Drive. Fun Seeking refers to the tendency to approach pleasure-oriented activities, Reward Responsiveness refers to a positive reaction to a reward, and Drive refers to pursuing desired goals. A four-factor structure of this measure has been widely replicated across various samples (Franken et al., 2005; Jorm et al., 1998; Vervoort et al., 2019; Weydmann et al., 2020), although some studies reported a five-factor structure (Gray et al., 2016; Poythress et al., 2008), dividing the BIS scale into anxiety and fear. Still, previous studies that will be briefly introduced

below pointed out that behavioral inhibition and activation were substantially related to personality traits, mood, and psychopathological outcomes, with most of the findings being in line with Gray's theory. First, empirical literature points out that behavioral inhibition is correlated with neuroticism positively and with extraversion negatively, while, in contrast, behavioral activation is associated positively with extraversion and negatively with neuroticism, and these findings are consistent, regardless of whether the Eysenck's model (e.g., Espinoza Oyarce et al., 2021; Knyazev et al., 2004) or the Big Five / Five Factor model was used (e.g., Dierickx et al., 2022; Şengül-İnal et al., 2018). Second, in addition to the trait-like manifestations of the BIS and BAS, both systems could be considered to have a role in mood regulation. In other words, elevated BIS activity could influence negative affect, while elevated BAS activity could lead to increased positive affect. Of course, some findings support this assumption (Aghababaei & Arji, 2014; Brenner et al., 2005; Espinoza Oyarce et al., 2021; Jorm et al., 1998). Since Gray's theory proposes that anxiety and impulsivity are the core personality dimensions related to the BIS and BAS, the previous findings regarding psychopathological features are quite expected. Elevated BIS activity is shown to be associated positively with general and social anxiety symptoms and anxiety disorders (Johnson et al., 2003; Kramer & Rodriguez, 2018; Randelović & Ćirović, 2022; Struijs et al., 2017). Third, elevated BAS activity is shown to be related to misconduct problems (Slobodskaya, 2007), delinquency (Hasking et al., 2011), binge drinking, and alcohol abuse (Franken & Muris, 2006; Kambouropoulos & Staiger, 2007), as well as with drug use (Hundt et al., 2008).

Impulsivity as dysfunctional and functional

In the broadest sense, impulsivity refers to the tendency to react recklessly with little or no consideration of the consequences. Although impulsivity can be seen as a part of the symptoms spectrum in certain disorders such as borderline, bipolar, and antisocial, there is a relative consensus about the status of impulsivity as a personality trait (DeYoung, 2011). The traditional view argues that impulsivity is a lack of self-control, meaning that almost all impulsive acts are merely undesirable, at least when it comes to consequences (e.g., engaging in risky behavior, possible injuries, or worsening social relationships through inappropriate behavior; see Cyders & Smith, 2008). However, according to Dickman (1990), impulsivity could be considered dual: dysfunctional and functional. Dickman created the model that distinguished two aspects of impulsivity, which were shown to be orthogonal or low-correlated in his and later research (e.g., Claes et al., 1999; Colledani, 2018; Franken et al., 2005). According to the model, dysfunctional impulsivity could be described as the tendency to non-reflective decision-making despite the negative consequences. In contrast, functional impulsivity reflects the

tendency to make quick decisions when doing so is beneficial. Dickman's studies (1990) showed that two types of impulsivity had different relations with the achievement in the cognitive matching task (e.g., higher accuracy for individuals with high functional impulsivity compared to those with low functional impulsivity – which was the effect not found for dysfunctional impulsivity) and with other impulsivity-related personality traits. More precisely, both types of impulsivity were positively related to venturesomeness and rathymia, whereby the functional aspect was more strongly associated with these variables. At the same time, dysfunctional impulsivity was negatively related to orderliness and cognitive structure, while functional impulsivity correlated positively with these variables (Dickman, 1990).

Some later studies provided additional support for these findings. For example, dysfunctional impulsivity was shown to be associated with aggression, anger, shorter response time in the “stop-go” task (Vigil-Colet & Codorniu-Raga, 2004), poorer inhibition in the stop-signal task (Castro-Meneses et al., 2015), a higher number of errors in the Stroop task, while functional impulsivity was shown to be related to a higher speed of processing in the Stroop task and the colour-word matching task (Brunas-Wagstaff et al., 1994). In addition, some recent studies showed that only dysfunctional impulsivity was related to specific maladaptive outcomes such as problem gambling (Cosenza et al., 2019), criminal behavior, and lifetime school deviance, while both aspects were associated with substance use (Wendel et al., 2022). Needless to say, these maladaptive outcomes are also associated with the Dark Triad traits, most consistently with psychopathy (for details see Oljača, 2022; Onyedire et al., 2021; Pechorro et al., 2021; Stenason & Vernon, 2016; Trombly & Zeigler-Hill, 2017; Wright et al., 2017).

Researchers did explore functional and dysfunctional impulsivity concerning behavioral inhibition and activation, but the results of those studies were not entirely consistent. One of the studies (Franken et al., 2005) showed that functional impulsivity was related to the lower BIS and higher BAS Drive, dysfunctional impulsivity was related to higher BAS Fun, while neither functional nor dysfunctional aspects were related to BAS Reward Responsiveness. However, the results from another study (Miller et al., 2004) showed that dysfunctional impulsivity was related to lower BIS, functional impulsivity to higher BAS Drive, while both aspects of impulsivity were unrelated to BAS Reward Responsiveness but associated positively with BAS Fun. Smillie and Jackson's (2006) research, which will be elaborated in more detail, provided a broader framework for understanding the differences in two aspects of impulsivity by including a number of personality variables alongside the BIS/BAS scales. According to this study, functional impulsivity is associated with lower BIS activity levels, indicative of a more relaxed attitude towards risk and a willingness to take chances. That is likely because

the BIS is responsible for monitoring and evaluating the potential risks associated with a given situation, and those with the lower levels of BIS activity will be less likely to be inhibited by these risks. At the same time, this study showed that functional impulsivity was also associated with the higher levels of BAS, which is responsible for the anticipation of reward, and is thus indicative of a greater motivation to seek out reward-producing activities. The positive relationship found between functional impulsivity and BAS indicates that those with high levels of functional impulsivity will be more likely to take risks in order to achieve rewards. Further on, their study indicated that functional impulsivity was associated with lower levels of dependence, anxiety, and neuroticism. This relationship suggests that those with the higher levels of functional impulsivity will be more independent, less anxious, and less prone to negative emotions. On the other hand, both aspects of impulsivity were shown to be positively associated with risk-taking, extraversion, and sensation-seeking. Therefore, this finding indicates that those with higher levels of functional and dysfunctional impulsivity will be more likely to take risks and more outgoing, and seek out more exciting and stimulating experiences. Finally, they showed that dysfunctional impulsivity was associated with higher levels of irresponsibility and psychoticism, and lower levels of conscientiousness and agreeableness. This suggests that those with higher levels of dysfunctional impulsivity will be more likely to act without thinking of the consequences, more prone to extreme and bizarre thoughts, and less likely to exhibit conscientious and agreeable behavior.

The Dark Triad

Two decades ago, Paulhus and Williams (2002) introduced the concept of the Dark Triad, which refers to three personality traits, namely Machiavellianism, narcissism, and psychopathy. In short, Machiavellianism describes a manipulative person who is ready to exploit others, guided by the idea that “the outcome justifies the deeds”. Narcissism is a subclinical manifestation of grandiosity, superiority, and dominance. This construct draws on previous attempts to separate narcissism as a subclinical trait from a personality disorder (see Morf & Rhodewalt, 2001; Raskin & Hall, 1979). Similar to narcissism, the construct of psychopathy in the Dark Triad also represents a subclinical adaptation that covers the main features of psychopathy: low levels of anxiety, a lack of empathy and remorse, and an elevated need for sensation/thrill-seeking. When considering the description of the Dark Triad traits, one could note that they are malevolent, socially undesirable, and therefore could have certain common features (e.g., high-approach and low-avoidance). Some of the studies reported that manipulativeness and callousness (Jones & Figueredo, 2013), low agreeableness (Paulhus & Williams, 2002), or fast life history strategy (Jonason

et al., 2012) could present the common core of the Dark Triad. However, many studies pointed to the differential relations of the Dark Triad traits to various outcome variables. For example, in the work context, individuals high in Machiavellianism and psychopathy might be less committed to the work organization and their colleagues. In contrast, those high on narcissism are likely to be committed to profession and career-building (Dostanić & Gojković, 2019). Similarly, O'Boyle et al. (2012) have produced meta-analytic data on the relations between the Dark Triad and work behavior, pointing out that psychopathy is almost unrelated, Machiavellianism moderately related, and narcissism relatively strongly related to counterproductive work behavior. In contrast, narcissism seems to have a minor role outside the work context, for example, in the case of antisocial and prosocial behavior. A recent study by Alsheikh (2020) showed that, in spite of the fact that adolescents high in narcissism were likely to commit crimes in general, those high in psychopathy were likely to have a high level of delinquency. Similarly, Wertag and Bratko (2018) showed that Machiavellianism and psychopathy were predictive of a low level of prosocial behavior, while narcissism was not. Although positively related to Machiavellianism and psychopathy, some findings suggest that selfish behavior is associated negatively with narcissism (Malesza & Kalinowski, 2021). These findings are somewhat surprising at first glance, but the extensive literature on the dark traits points out that narcissism is likely to be the "brightest" dark trait (Egan et al., 2014; Kowalski et al., 2016; Mededović & Petrović, 2015; Nedeljković & Tucaković, 2022), closely related to status-seeking and reputation motives (de Holanda Coelho et al., 2021; Nedeljković & Opačić, 2021).

However, numerous studies reported similarities in narcissism and psychopathy associations with various outcomes, thus distinguishing Machiavellianism from these two traits. Stenason and Vernon (2016) showed that the number of drugs (lifetime used) was associated with psychopathy and narcissism, but unrelated to Machiavellianism. Moreover, individuals high in narcissism are more likely to use cocaine or heroin, while individuals high in psychopathy are likely to have risky sex (Pechorro et al., 2021). In contrast, those high in Machiavellianism are prone to harmful alcohol use (Nnam et al., 2021). Similarly, individuals high in psychopathy and narcissism, but not those high in Machiavellianism, are likely to engage in short-term partnership relations using online dating networks (Tucaković et al., 2022). Individuals high in Machiavellianism are also more likely to use those services to improve flirting and social skills (Lyons et al., 2022). In contrast to the studies reporting that the Dark Triad traits are differentially related to various outcomes, some research showed the same pattern of relations with various outcomes. For example, all of the Dark Triad traits were shown to be associated positively with reactive and proactive aggression (Barlett, 2016; Dinić et al., 2019), and impulsivity and sensation-seeking (Crysel et al., 2013),

with the magnitude of correlation being in the same (mostly moderate) range for all traits. Since impulsivity is one of the variables our study is focused on, we find it necessary to address the findings regarding the relations between the Dark Triad and impulsivity (both functional and dysfunctional).

The Dark Triad relationships with impulsivity and the BIS/BAS

There are only a few studies that explored the relationship between the Dark Triad traits and impulsivity as functional and dysfunctional. One of the most prominent findings is that the Dark Triad traits are related to both the dysfunctional and functional aspects of impulsivity, but differentially; that is – psychopathy is associated with dysfunctional impulsivity, narcissism is related to functional impulsivity, whereas Machiavellianism is unrelated to both dysfunctional and functional impulsivity (Jones & Paulhus, 2011). Another study, conducted in theft-prone individuals only (Lyons & Jonason, 2015), showed that all of the Dark Tetrad traits (Machiavellianism, narcissism, psychopathy, sadism) were associated positively with both types of impulsivity, whereas narcissism was more strongly related to the functional aspect, while (secondary) psychopathy was more strongly related to dysfunctional impulsivity. Contrary to this, Jonason and Jackson (2016) showed that all of the Dark Triad members were positively related to the dysfunctional aspect of impulsivity, but none were related to the functional aspect. Given these results, one could note that the findings of previous studies are not entirely congruent. One of the reasons for this may be the fact that Lyons and Jonason (2015) reported the findings on the sample that was *per se* biased, which hinders the broader generalization of their results, while Jonason and Jackson (2016) used the Dirty Dozen measure (Jonason & Webster, 2010) of the Dark Triad which differs from the Short Dark Triad (see Dinić et al., 2018). However, according to the theoretical assumptions (see Jones & Paulhus, 2014; Paulhus & Williams, 2002), one could expect individuals high in psychopathy to display dysfunctional impulsivity to a greater extent, those high in narcissism to have more functionally impulsive reactions, while the ones high in Machiavellianism probably will not have pronounced any type of impulsivity.

The findings on the relationship between the Dark Triad traits and the BIS/BAS scales strongly support the aforementioned distinctive tendencies in narcissism, psychopathy, and Machiavellianism regarding impulsivity. A recent meta-analysis on the Dark Triad and BIS/BAS associations (Włodarska et al., 2021) provided the framework for a nuanced understanding of these complex relations, so we need to consider those findings in detail. Włodarska and colleagues (2021) found that narcissism was positively related to the BAS Drive, BAS Fun Seeking, and BAS Reward Responsiveness, implying

that individuals high in narcissism were highly motivated by reward and pursue pleasure and novelty. However, narcissism was also negatively related to the BIS component, suggesting that individuals high in narcissism were less sensitive to punishment and potential threats. This lack of sensitivity may reflect narcissistic individuals' sense of entitlement and belief in their invincibility. Further on, they found that psychopathy was positively related to the BAS Drive and BAS Fun Seeking, which indicates that individuals high in psychopathy are highly motivated by reward and pursue pleasure and novelty. Psychopathy was also negatively related to the BIS, meaning that individuals high in psychopathy are less sensitive to punishment and potential threats. It is plausible to understand that the lack of sensitivity may reflect psychopathic individuals' impulsivity and risk-taking behavior. Finally, the weakest positive associations were found for Machiavellianism with the BAS Drive and BAS Fun Seeking. These findings indicated that individuals high in Machiavellianism could be, to some extent, motivated by reward and they pursued pleasure and novelty. However, Machiavellianism was also (weakly) positively related to the BIS component, meaning that individuals high in Machiavellianism could also be somewhat sensitive to punishment and potential threats. Therefore, this relationship could be seen as a counterweight to reward and novelty-seeking tendencies in those high in Machiavellianism, which reflects their "push-pull" nature (Bloxsom et al., 2021; Jones & Neria, 2015).

The present study

The extensive literature (e.g., Crysel et al., 2013; Jonason & Jackson, 2016; Jones & Paulhus, 2011; Lyons & Jonason, 2015; Włodarska et al., 2021) pointed out that the Dark Triad traits were associated with behavioral inhibition, behavioral activation, and impulsivity (including differential relations with functional and dysfunctional aspects). However, to our best knowledge, neither research aimed to explore the joint role of BIS, BAS, and functional and dysfunctional impulsivity in the Dark Triad traits. Given the theoretical assumptions on the BIS/BAS similarity with functional and dysfunctional impulsivity, as well as empirical findings on their differences, we aim to explore their role in the Dark Triad in the case when both constructs are taken together.

We hypothesize that BIS/BAS and dysfunctional and functional impulsivity, despite partially overlapping, will both have a unique contribution to explaining the individual differences in psychopathy and narcissism, but not in Machiavellianism. This hypothesis is rooted in previous findings. First and foremost, according to Włodarska et al. (2021) meta-analytic study which provides quite robust evidence of true relations in

population, psychopathy and narcissism are both moderately associated with the BIS (negatively) and BAS (positively), while Machiavellianism is weakly associated with the BAS only (positively). Furthermore, although the findings regarding the relationship between the Dark Triad and impulsivity are not entirely consistent, some of those (e.g., Jones & Paulhus, 2011), which are to a greater extent theoretically grounded, showed that dysfunctional impulsivity was moderately associated with higher psychopathy and narcissism was moderately related to functional impulsivity, while Machiavellianism was not associated with any of the two types of impulsivity. Therefore, considering the strength of associations of the Dark Triad traits with the BIS/BAS and two aspects of impulsivity, as well as the nature of relations between the BIS/BAS with functional and dysfunctional impulsivity, one could assume that, if taken together, both of these constructs are likely to have a unique contribution in explaining the surface of psychopathy and narcissism. In the case of Machiavellianism, where only weak correlations with both constructs could occur, it is reasonable to assume that both constructs will not have a unique contribution.

Method

Sample and procedure

The sample included 318 individuals aged between 18 and 65 ($M_{age} = 28.67$, $SD_{age} = 8.95$; 75.2% females). The data were collected online using the *Google Forms* platform. We used convenient sampling by recruiting participants through invitations on social networks. The study was conducted in line with the 1964 Declaration of Helsinki and the Ethical code of the Serbian Psychological Society. All participants had provided their informed consent prior to taking part in the study, and participation was voluntary, anonymous, and uncompensated.

Measures

The BIS/BAS Scales (Carver & White, 1994), a 20-item self-report questionnaire, were used to assess individual differences in personality dimensions that reflect the sensitivity of two motivational systems – *behavioral inhibition system* (BIS) and *behavioral activation system* (BAS). The questionnaire consists of two primary scales: the BIS (7 items; e.g., “*Criticism or scolding hurts me quite a bit*”) and the BAS (13 items) that can be divided into three subscales – BAS Fun Seeking (4 items; e.g., “*I’m always willing to try something new if I think it will be fun*”), BAS Reward Responsiveness (5 items; e.g., “*It would excite me to win a contest*”) and BAS Drive (4 items; e.g., “*When I want something I usually go all-out to get it*”). A

4-point scale (from 1 = *very false for me* to 4 = *very true for me*) was used. In this research, Cronbach's alphas were found to range from .62 (BAS Reward Responsiveness) to .77 (BIS).

Dickman's (1990) Impulsivity Inventory was used to measure two types of impulsivity, namely Functional and Dysfunctional impulsivity. It consists of 23 items with forced-choice "true/false" answers, whereas 11 items are designed to tap functional impulsivity (e.g., "*I would enjoy working at a job that required me to make a lot of split-second decisions*"), and another 12 items are designed to tap dysfunctional impulsivity (e.g., "*I often say and do things without considering the consequences*"). Acceptable Omega values were obtained in our study for both functional and dysfunctional impulsivity (.78 and .80, respectively).

The Short Dark Triad (Jones & Paulhus, 2014) was used to assess Machiavellianism (e.g., "*It's wise to keep track of information that you can use against people later*"), narcissism (e.g., "*People see me as a natural leader*"), and psychopathy (e.g., "*People who mess with me always regret it*"). It consists of 27 items (9 items per trait) followed by a 5-point response scale (from 1 = *strongly disagree* to 5 = *strongly agree*). In this research, Cronbach's alphas were .69 (narcissism and psychopathy) and .76 (Machiavellianism).

Results

We calculated the descriptives and bivariate correlation coefficients between all study variables, including age and sex (coded as a binary variable, where value 1 refers to male sex). Our results (Table 1) showed that Machiavellianism was uncorrelated with behavioral inhibition and functional impulsivity, while it was correlated positively with all the BAS scales and dysfunctional impulsivity. Narcissism correlated negatively with the BIS and positively with all the BAS scales and functional impulsivity, while it was uncorrelated with dysfunctional impulsivity. Similar to narcissism, psychopathy correlated negatively with the BIS, BAS Fun Seeking, BAS Drive, but also with both aspects of impulsivity, while it was not associated with BAS Reward Responsiveness. Despite the similarity in relations with the BIS/BAS, it is crucial to note that narcissism was more strongly associated with functional impulsivity compared to psychopathy. In contrast, psychopathy was more strongly associated with dysfunctional impulsivity, which was not associated with narcissism. As can be seen, all significant correlations were in the range of low to moderate in magnitude. Although the exploration of relations between the BIS/BAS scales and impulsivity is not the main focus of the research, we find it necessary to note that these correlations ranged from non-significant to moderate in magnitude. In other words, the results showed that the expression of impulsivity was irreducible to behavioral inhibition and

activation, even though it was related. Our results also showed that the Dark Triad, BIS/BAS scales, and impulsivity were associated with the participants' sex. Higher levels of all dark traits, functional impulsivity, BAS Fun Seeking, and a lower level of behavioral inhibition were associated with the male sex. It could also be noted that age correlated negatively with psychopathy, BAS Fun Seeking and BAS Reward Responsiveness, while it was uncorrelated with other BAS Drive, BIS, and both aspects of impulsivity.

Table 1
Descriptives and correlations for all study variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Sex (male)											
2. Age	-.10										
3. Machiavellianism	.18**	-.05									
4. Narcissism	.16**	-.08	.33**								
5. Psychopathy	.20**	-.11*	.46**	.38**							
6. BIS	-.23**	-.06	-.02	-.30**	-.19**						
7. BAS Fun Seeking	.13*	-.12*	.17**	.37**	.44**	-.17**					
8. BAS Reward Responsiveness	.03	-.16**	.22**	.24*	.10	.27*	.26*				
9. BAS Drive	-.05	.00	.17**	.35**	.19*	-.22**	.36**	.25**			
10. Functional impulsivity	.22**	.07	-.02	.37**	.20*	-.49**	.32**	-.06	.19**		
11. Dysfunctional impulsivity	-.01	.06	.12*	.06	.39**	.04	.36**	-.01	.13*	.13*	
M	/	28.67	3.00	2.78	1.97	22.01	11.31	16.84	11.30	5.13	2.81
SD	/	8.95	0.71	0.64	0.60	3.73	2.31	2.26	2.47	2.99	2.80

Notes. Sex is coded as Female = 0; Male = 1; M = mean; SD = standard deviation.

* $p < .05$. ** $p < .01$.

Following the main research aim, we ran three hierarchical multiple linear regression analyses in order to explore the amount of variance in the Dark Triad that could be explained by behavioral inhibition, behavioral activation, and impulsivity. Since the previous analysis showed that age and sex were somewhat associated with the dark traits, BIS/BAS scales, and impulsivity, we included these variables in the regression models in the first step to control their effect. The BIS/BAS scales were included in the second step as predictors, and impulsivity variables were added in the third step, whereby Machiavellianism, narcissism, and psychopathy were set as criterion variables in each case. The results of regression analyses are shown in Table 2.

Table 2
BIS/BAS scales and impulsivity as the predictors of the Dark Triad traits

Variable	Machiavellianism (β)			Narcissism (β)			Psychopathy (β)		
	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Sex (male)	.18**	.20**	.21**	.09	.09	.06	.12*	.12*	.13**
Age	-.03	.00	.00	-.04	-.04	-.05	-.06	-.06	-.09
BIS		.06	.00		-.27**	-.18**		-.10	-.16**
BAS FS		.07	.05		.19**	.15*		.39**	.26**
BAS RR		.16*	.18**		.21**	.21**		.01	.06
BAS D		.13*	.13*		.17**	.17**		.03	.01
FI			-.11			.21**			-.02
DI			.11			-.03			.31**
F	5.50**	6.13**	5.39**	4.71*	19.75**	16.92**	7.99**	15.19**	16.90**
adj.R ²	.03	.09	.10	.02	.26	.29	.04	.21	.29
ΔR^2		.07**	.02		.25**	.03**		.18**	.08**

Notes. Sex is coded as Female = 0; Male = 1; BAS F = BAS Fun Seeking; BAS RR = BAS Reward Responsiveness; BAS D = BAS Drive; FI = Functional Impulsivity; DI = Dysfunctional impulsivity.

* $p < .05$. ** $p < .01$.

The results of regression analyses mostly confirmed the results of correlation analysis. Since the regressions were conducted hierarchically, we will focus first and foremost on the models with all predictors included. The BIS, BAS Fun Seeking, and two aspects of impulsivity failed to predict Machiavellianism, while BAS Reward Responsiveness and BAS Drive contributed to explaining Machiavellian tendencies. However, the overall predictive contribution was quite small, and impulsivity variables were insignificant predictors. In contrast to Machiavellianism, individual differences in narcissism and psychopathy were far better explained. The BIS predicted both narcissism and psychopathy negatively, while BAS Drive predicted them positively. However, the rest of the predictors showed a differential contribution. BAS Reward Responsiveness and BAS Fun Seeking predicted narcissism positively and were insignificant in predicting psychopathy. A similar pattern was observed in the case of impulsivity variables. In concrete terms, functional impulsivity was a significant predictor of narcissism, but not psychopathy, while dysfunctional impulsivity contributed to explaining psychopathy, and had an insignificant contribution in predicting narcissism.

The inclusion of impulsivity variables was shown to have an incremental predictive contribution over the BIS/BAS scales in explaining narcissism and psychopathy, and no significant effect on the Machiavellianism criterion. However, the inclusion of these variables, besides having an increasing effect in explaining the variance in psychopathy and narcissism, also decreased the predictive power of BIS in the case of narcissism, and BAS Fun Seeking in both cases. These effects indicated the possible mediation that we tested using Hayes' (2013) procedure (with 5000 bootstrapped samples) in the next step. In examining the possible mediation effect of the variables of interest, all other predictor variables found in the final models were included as controls. The analyses showed that functional impulsivity partially mediated the effect of BIS (-.089 [-.149, -.037]) and BAS Fun Seeking (.045 [.015, .085]) on narcissism, while dysfunctional impulsivity partially mediated the effect of BAS Fun Seeking (.125 [.069, .186]) on psychopathy.

Discussion

The main aim of this study was to explore the role of BIS/BAS and two types of impulsivity in the Dark Triad. Relying upon the theoretical considerations and previous empirical findings, we hypothesized that BIS/BAS and impulsivity measures would have a unique contribution in explaining the individual differences in psychopathy and narcissism, but not in Machiavellianism. Our results strongly supported the hypothesis. Both constructs contributed mostly independently to explaining a reasonably high portion of the variance in narcissism and psychopathy, while, in contrast, their contribution in predicting Machiavellianism was shown to be quite small.

The BIS, BAS Reward Responsiveness, BAS Drive, and Functional impulsivity were significant predictors of narcissism. Therefore, individual differences in narcissism can be depicted from the standpoint of behavioral inhibition, behavioral activation, and impulsivity. Individuals high in narcissism can be described as those who have low levels of anxiety and fear; they are persistent in pursuing their own goals, highly reactive to rewards, and prepared for engaging in activities; they also have the tendency to react quickly in situations when that is optimal. This description corroborates previous findings on narcissism's nature. For instance, previous findings on organizational behavior (Dostanić & Gojković, 2019) showed that individuals high in narcissism were likely to be committed to profession and career-building. Therefore, it is reasonable to assume that persistence in pursuing their own goals and reactivity to rewards, supplemented by a tendency to make quick decisions when this is beneficial, are the features that could be seen as crucial for corporative success. In other words, this constellation of features helps individuals high in narcissism to take full advantage of

opportunities. For that reason, it is not surprising that out of the Dark Triad traits, narcissism is the most strongly related to counterproductive work behavior (O'Boyle et al., 2012). In addition, low levels of anxiety and fear, alongside the pronounced striving to reward, may facilitate rule-breaking behavior and committing minor crimes observed in individuals high in narcissism (Alsheikh, 2020).

Similar to narcissism, the same amount of psychopathy variance was explained by the BIS, BAS Fun Seeking, BAS Drive, and dysfunctional impulsivity. Therefore, a part of individual differences in psychopathy can also be depicted from the standpoint of the BIS/BAS activity and impulsivity. Individuals high in psychopathy can be described as low-inhibited, high-aroused, and prone to dysfunctional impulsivity. Although one could note the similarity with narcissism depiction from the standpoint of the BIS/BAS, we find it necessary to outline the key differences. The first difference is that BAS Fun Seeking was shown to have a higher contribution in psychopathy compared to narcissism. The second difference is that BAS Reward Responsiveness and BAS Drive were insignificant predictors of psychopathy, while being significant in predicting narcissism. Although individuals high in psychopathy and those high in narcissism could both manifest high-approach behavior, this result points to the substantial differences between the two dark traits. According to our results, individuals high in psychopathy are likely to manifest pleasure-seeking and high-approaching behavior while being insensitive to punishment and reward. In contrast, individuals high in narcissism, also insensitive to punishment, are more likely to be reward-dependent and goal-oriented. This finding largely corroborates previous findings on the Dark Triad and BIS/BAS associations (Włodarska et al., 2021). The third difference is that dysfunctional impulsivity, but not Functional, was predictive of psychopathy, while in contrast, Functional, but not dysfunctional impulsivity, was predictive of narcissism.

This result complements the finding of substantial differences in psychopathy and narcissism (Jonason & Jackson, 2016; Paulhus & Williams, 2002). In other words, even though individuals high in psychopathy and high in narcissism are both likely to act impulsively, those high in psychopathy are more likely to act recklessly. This result is in line with previous findings showing that psychopathy is associated with risky sexual activities (Pechorro et al., 2021) and high-level delinquency (Alsheikh, 2020). More specifically, we argue that some maladaptive outcomes related to psychopathy are somewhat caused by dysfunctional impulsivity. Previous findings showed that dysfunctional impulsivity was associated with aggression, anger (Vigil-Colet & Codorniu-Raga, 2004), problem gambling (Cosenza et al., 2019), and irresponsibility (Smillie & Jackson, 2006). Moreover, Dysfunctional impulsivity is associated with a low level of inhibition, either questionnaire-

assessed (Miller et al., 2004) or task-measured (Castro-Meneses et al., 2015; Vigil-Colet & Codorniu-Raga, 2004). In contrast, Functional impulsivity is related to a higher processing speed in cognitive-perceptual tasks (Brunas-Wagstaff et al., 1994; Dickman, 1990). For that reason, we find it reasonable to argue that impulsivity in psychopathy (which is primarily dysfunctional), and impulsivity in narcissism (which is primarily functional), makes the crucial distinction in the outcomes related to these traits. In other words, although both traits are similarly related to some outcomes such as proactive and reactive aggression (Barlett, 2016; Dinić et al., 2019), sensation-seeking (Crysel et al., 2013), drug use (Stenason & Vernon, 2016), and short-term mating (Tucaković et al., 2022), impulsivity in psychopathy could be seen as detrimental, while in narcissism it is more likely to be beneficial. This argument is in line with previous findings that narcissism, although socially undesirable, could be seen as “the less dark” trait (de Holanda Coelho et al., 2021; Egan et al., 2014; Kowalski et al., 2016; Međedović & Petrović, 2015; Nedeljković & Opačić, 2021). Moreover, the results of mediation analyses strongly supported this distinction. On the one hand, it could be noted that low inhibition and pronounced fun-seeking tendencies in individuals with high narcissism are likely to be partially reflected through functional impulsivity. On the other, fun-seeking tendencies are likely to be partially reflected in psychopathy through dysfunctional impulsivity.

Lastly, we need to consider the results regarding Machiavellianism. As noted earlier, the BIS, BAS Fun Seeking, and two aspects of impulsivity failed to predict individual differences in this trait, while BAS Reward Responsiveness and BAS Drive were significant predictors. This result is in line with our hypothesis, but we need to clarify why we made such a hypothesis, which claims that narcissism and psychopathy are likely to be predicted by both the BIS/BAS and impulsivity, while Machiavellianism is not. First, we wanted to explore the role of behavioral inhibition and activation, and both dysfunctional and functional impulsivity in all three traits comprising the Dark Triad. Second, previous findings showed that Machiavellianism, in contrast to the other two traits, was almost unrelated to both the BIS/BAS and impulsivity (Jones & Paulhus, 2011; Włodarska et al., 2021), which led to our assumption that these constructs will not both have a unique contribution. Impulsivity aspects were not predictive of Machiavellianism, while two BAS scales (i.e., BAS Reward Responsiveness and BAS Drive) contributed to prediction, although the amount of variance explained was reasonably small. These results provided evidence of two major distinctions between Machiavellianism and the other Dark Triad members. First, individuals high in Machiavellianism, in contrast to those high in narcissism and psychopathy, have certain advantages in terms of inhibition and impulse control. Even though they are likely to have approaching behavior, similar to individuals high in narcissism, such behavior is likely

to be more controlled and mainly activated under rewarding conditions. Second, individuals high in Machiavellianism, in contrast to those high in the other two traits, are less prone to engage in the activities that bring no additional benefit apart from pure fun. Taken together, these results indicate that those high in Machiavellianism are not prone to reacting on the spur of the moment, which might benefit their orientation towards long-term planning and goals (Jones & Paulhus, 2011; Malesza, 2020). This distinction is also supported by heritability studies. On the one hand, there is sizeable evidence that impulsivity and inhibition are significantly influenced by genetic factors (Anokhin et al., 2017; Tuvblad et al., 2017). On the other, although the Dark Triad traits are also genetically influenced, some findings show that environmental influence is more attributable to Machiavellianism than the other two traits (Campbell et al., 2009; Vernon et al., 2008). Therefore, it is plausible to note that biologically rooted features such as impulsivity and inhibition are more likely to have a greater role in psychopathy and narcissism than in Machiavellianism.

Limitations and recommendations for future research

Naturally, our study does not come without limitations. We employed the correlational design only, whereby all the variables were assessed using only one measure. For that reason, we find it necessary to suggest for future studies to apply more than one measure per construct. This especially stands true for the dark traits measures which differ in their coverage of the trait characteristics (i.e., in some measures, the aspects of primary versus secondary psychopathy or grandiose versus vulnerable narcissism are fairly more covered). In addition, it would be beneficial if further research applied the experimental assessment of impulsivity alongside the questionnaire-based assessment.

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Bihevioralna inhibicija, bihevioralna aktivacija i impulsivnost u Mračnoj trijadi

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Grejova Teorija osetljivosti na potkrepljenje nalaže da je sistem bihevioralne inhibicije (BIS) zadužen za regulaciju anksioznosti i straha kao odgovora na spoljne stimulse, dok je sistem bihevioralne aktivacije (BAS) zadužen za obradu pozitivnih znakova kao što su nagrade. Dikmanov model razlikuje disfunkcionalnu impulsivnost (DI), koju karakteriše nepromišljeno donošenje odluka, od funkcionalne impulsivnosti (FI), koja odražava sklonost ka donošenju brzih odluka kada je to povoljno. Cilj ove studije je da ispita potencijal BIS/BAS i DI/FI da objasne varijansu crta Mračne trijade. Uzorkom je obuhvaćeno 318 prigodno regrutovanih ispitanika ($M_{uzrast} = 28.67$, $SD_{uzrast} = 8.95$; 75.2% ženskog pola) koji su popunili BIS/

BAS skale (BIS, BAS Traženje zabave, BAS Osetljivost na nagradu i BAS Nagon), Dikmanov Inventar Impulsivnosti i Kratku Mračnu Trijadu (Makijavelizam, narcizam i psihopatija). BAS Osetljivost na nagradu i BAS Nagon su bili značajni prediktori Makijavelizma, što je ukazalo da pojedinci sa visokim skorovima na ovoj crti mogu biti osetljivi na pozitivno potkrepljenje. BIS, BAS Traženje zabave i DI su bili značajni prediktori psihopatije, dok su BIS, sve BAS skale i FI bili značajni prediktori narcizma. Ovi rezultati sugerišu da su slaba inhibicija, niska kontrola impulsa i jaka sklonost ka aktivnostima usmerenim na zadovoljstvo faktori koji značajno doprinose objašnjenju površine psihopatije, i mogu se smatrati posebno važnim za maladaptivno ponašanje. Sa druge strane, pojedinci sa visokim narcizmom mogu biti osetljivi na pozitivno potkrepljenje, usmereni na ciljeve i ispoljavati funkcionalnu impulsivnost, što im omogućuje da iskoriste prilike.

Ključne reči: BIS/BAS, Funkcionalna impulsivnost, Disfunkcionalna impulsivnost, Mračna trijada