

MORAL PHYSIOGNOMY. A COMPARATIVE STUDY OF HEALTHCARE PROFESSIONALS AND ENGINEERING STUDENTS

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Abstract

The aim of the current study is to identify the relation between Dark Triad, locus of control and empathy, as well as to examine the differences according to professional field (medical and engineering) and age. Individuals with high Dark Triad scores, low empathy, and reduced guilt tend to externalize responsibility for their actions. Engineering students show stronger manipulative and cynical tendencies and higher psychopathy-related traits, while medical professionals display greater empathic capacity.

Keywords: dark triad, locus of control, empathy.

1. THEORETICAL FRAMEWORK

1.1. DARK TRIAD

The Dark Triad, introduced by Paulhus and Williams (2002), refers to three socially aversive personality traits within the normal range of personality functioning: Machiavellianism, narcissism, and subclinical psychopathy. These traits share several characteristics to varying degrees, including low empathy, interpersonal callousness, manipulateness, and a tendency to pursue personal gain, which may be driven by extrinsic motives (machiavellianism, psychopathy) or intrinsic self-enhancement motives (narcissism).

Machiavellianism is characterized by manipulateness, interpersonal insensitivity, and a strategic, goal-oriented approach, with individuals engaging in calculated actions, forming alliances, and maintaining a favorable reputation to obtain personal benefits (Jones & Paulhus, 2014; Rogoza & Ciecuch, 2020). This strategic component differentiates Machiavellianism from the other Dark Triad traits.

The subclinical dimension of narcissism, conceptualized by Raskin and Hall (1979), is characterized by manipulateness, interpersonal insensitivity, and a tension between grandiose self-importance and underlying insecurity. Subclinical

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psychopathy is marked by low emotionality, including reduced empathy and anxiety, as well as poor self-control, expressed through impulsivity and thrill-seeking behaviors (Jones & Paulhus, 2014).

Research indicates that levels of Dark Triad traits tend to decline with age, particularly Machiavellianism and psychopathy (Čopková, 2022; Götz *et al.*, 2020; Hartung *et al.*, 2022). During early adulthood, psychopathy-related traits are often more pronounced, possibly reflecting developmental immaturity and greater naïveté (Makim & Shetty, 2018). These findings suggest that life experience, cognitive maturation, and improved emotional regulation contribute to a gradual reduction in antisocial and manipulative tendencies.

1.2. LOCUS OF CONTROL

Locus of control, defined as a generalized expectancy, refers to the extent to which individuals attribute the causes of events to their own actions or to external circumstances (Rotter, 1966). According to Rotter (1966), an internal locus of control involves the belief that outcomes are contingent upon one's own behavior, whereas an external locus of control reflects the perception that outcomes are determined by factors outside one's personal control.

A meta-analysis conducted by Aldousari and Ickes (2021), including studies published between 1969 and 2018, reported a positive association between Machiavellianism and an external locus of control. Similarly, Bonfa-Araujo *et al.* (2021) identified Machiavellianism, narcissism, and psychopathy as significant predictors of externality, with Machiavellianism showing the most consistent association. In contrast, findings regarding narcissism remain inconsistent, and the relationship between psychopathy and locus of control is still unclear, suggesting the presence of gaps in the existing literature.

1.3. EMPATHY

Empathy can be conceptualized as comprising four dimensions: understanding, feeling, perspective-taking, and differentiation between self and others (Eklund & Meranius, 2021). Halpern (2003) defines empathy as both an experiential understanding of others' emotional states and a perceptive-intuitive process that complements logical analysis. In the medical context, empathy involves the ability to recognize, understand, and communicate an awareness of patients' emotions (Stepien & Baernstein, 2006).

Empirical evidence indicates that engineering students tend to display lower levels of empathy compared to students enrolled in health-related programs (Rasoal *et al.*, 2012). Further research has demonstrated a negative association between Dark Triad traits and empathy, particularly in the case of psychopathy and Machiavellianism (Kornilova *et al.*, 2021; Wai & Tiliopoulos, 2012; Yap & Berezina, 2021). Across studies, Machiavellianism consistently emerges as a significant predictor of reduced empathy, alongside psychopathy, whereas narcissism may, in certain contexts, be positively associated with empathic behavior (Ali *et al.*, 2009; Pajevic *et al.*, 2018).

Some individuals exhibit high levels of empathy together with elevated levels of all Dark Triad traits, a phenomenon referred to as “dark empathy” (Das *et al.*, 2025).

1.4. PERSON-ENVIRONMENT FIT AND OCCUPATIONAL SOCIALIZATION

Person–environment fit refers to the degree of congruence between individual characteristics and the professional context, influencing career choice and adaptation (De Cooman & Vleugels, 2022). Occupational socialization involves the development of personal resources through social and psychological integration, guided by individual orientations and learning experiences, with the aim of enhancing professional functioning (Vaisburg, 2015). In their interaction with the environment, individuals tend to (1) seek roles that align with their traits, (2) leave or change fields when a mismatch occurs, and (3) undergo personality changes as a result of environmental influences (Denissen *et al.*, 2014).

2. OBJECTIVES AND RESEARCH METHODOLOGY

This study aims to examine the relationships among the Dark Triad, locus of control, and empathy, as well as differences based on socio-demographic variables in healthcare professionals and engineering students.

2.1. HYPOTHESES

- H1. Dark Triad traits are positively associated with locus of control.
- H2. Psychopathy is negatively associated with empathy.
- H3. Machiavellianism and narcissism are significant predictors of empathy.
- H4. Dark Triad traits, locus of control, and empathy differ as a function of professional field.
- H5. Machiavellianism and psychopathy differ as a function of age.

2.2. PARTICIPANTS

The study was conducted on a sample of 233 participants, including 129 healthcare professionals (42.5% nurses, 5.6% physicians, and 7.3% auxiliary healthcare staff) and 104 engineering students. The sample consisted of 80 males and 153 females, aged between 18 and 74 years ($M = 33.45$, $SD = 13.30$). Participants were recruited voluntarily *via* an online platform. All respondents provided informed consent, with guaranteed anonymity, confidentiality, and the right to withdraw at any time. Age groups were created by equally dividing the sample into three categories using statistical software.

2.3 INSTRUMENTS

The Short Dark Triad – SD3 (Jones & Paulhus, 2014). This questionnaire was used to assess the levels of Machiavellianism, narcissism, and psychopathy. The instrument comprises 27 items organized into three subscales. Responses are

rated on a five-point Likert scale, with higher scores indicating higher levels of the respective traits. In the original study, Cronbach's alpha coefficients were .77 for Machiavellianism, .71 for narcissism, and .80 for psychopathy. In the present study, internal consistency coefficients were .71, .58, and .62 for the respective subscales. Although the Alpha coefficients for narcissism ($\alpha = .58$) and psychopathy ($\alpha = .62$) were relatively low, they align with typical values reported for the SD3 brief instrument in non-clinical populations. In short scales measuring highly heterogeneous, subclinical traits, internal consistency estimates are frequently attenuated due to the limited number of items, yet they remain acceptable for group-level comparative purposes.

Rotter's Locus of Control Scale (Rotter, 1966) consists of 29 forced-choice items, including 6 filler items. Each item pair presents two statements, one reflecting an internal orientation and the other an external orientation, and participants are asked to select the statement they consider most accurate. Higher scores indicate a more external locus of control, whereas lower scores reflect a more internal orientation. In the present study, the Cronbach's alpha coefficient was .70.

The Empathy Scale (Cloninger, 1994). This scale consists of eight items rated on a five-point Likert scale, with higher scores indicating higher levels of empathy. In the present study, internal consistency was high (Cronbach's $\alpha = .87$), similar to the reliability coefficient reported by the author (Cronbach's $\alpha = .87$). The scale is derived from Cloninger's Temperament and Character Inventory (TCI), in which empathy represents one of the facets of the character dimension Cooperativeness. In the present study, the items were selected from the International Personality Item Pool (IPIP, n.d.).

3. RESULTS

Table 1 presents the descriptive statistics and distribution indices for Machiavellianism, narcissism, psychopathy, locus of control, and empathy. The obtained values indicate that the variables follow an approximately normal distribution.

Table 1

Descriptive statistics

	N	Min	Max	M	SD	Skewness	Kurtosis
Machiavellianism	233	10	45	26.98	5.74	-.18	.12
Narcissism	233	12	41	25.94	4.57	-.02	.85
Psychopathy	233	9	32	17.54	4.90	.51	-.23
Locus of control	233	0	23	10.70	3.76	-.04	.49
Empathy	233	15	40	32.22	4.78	-.43	.50

Table 2 presents the Pearson correlation matrix for the study variables.

Table 2

Intercorrelations between study variables

	M (SD)	1	2	3	4	5
Machiavellianism	26.98 (5.74)	-				
Narcissism	25.94 (4.57)	.29**	-			
Psychopathy	17.54 (4.90)	.40**	.14*	-		
Locus of control	10.70 (3.76)	.22**	.07	.11	-	
Empathy	32.22 (4.78)	-.16**	.13*	-.13*	-.16*	-

H1. Dark Triad traits are positively associated with locus of control.

Pearson's correlation analysis (Table 2) revealed a moderate positive correlation between Machiavellianism and locus of control ($r = .22, p < .01$). The correlations between narcissism and locus of control ($r = .07, p > .05$) and between psychopathy and locus of control ($r = .11, p > .05$) were positive but not statistically significant. Therefore, the hypothesis was only partially supported.

H2. Psychopathy is negatively associated with empathy.

Pearson correlation analysis (see Table 2) indicated a weak but significant negative association between psychopathy and empathy ($r = -.13, p < .05$). Thus, the hypothesis was supported.

H3. Machiavellianism and narcissism predict empathy

A multiple linear regression analysis was conducted to test whether Machiavellianism and narcissism predict empathy (see Table 3). The model explained 6% of the variance in empathy, indicating a small effect size. Both predictors were statistically significant, with Machiavellianism negatively predicting empathy and narcissism positively predicting empathy. Thus, the hypothesis was supported.

Table 3

Summary Table of Regression Analysis

Variable		Unstandardized regression coefficients		Standardized regression coefficients	t
		B	SE	β	
R^2	.06				
F	8.23*				
Constant	31.84				
Machiavellianism		-.19	.05	-.23	-3.45*
Narcissism		.21	.07	.20	3.06*

H4. Dark Triad traits, locus of control, and empathy differ as a function of professional field.

Independent-samples *t*-tests indicated significant differences between professional groups for Machiavellianism and psychopathy (see Table 4). Engineering students obtained higher scores on both traits compared to healthcare professionals, with medium effect sizes. No significant differences were observed for narcissism and locus of control. Thus, the hypothesis was partially supported..

Table 4

Summary Table of *t*-test Analysis

	Profession	M	SD	t	df	p	d Cohen
Machiavellianism	medical	25.44	5.98	-4.76	231	< .001	.63
	engineering	28.89	4.82				
Narcissism	medical	25.95	4.27	.02	231	> .05	.01
	engineering	25.93	4.95				
Psychopathy	medical	16.63	4.52	-3.22	231	< .01	.42
	engineering	18.67	5.14				

Regarding locus of control, the independent-samples *t* test did not reveal a statistically significant difference between the two groups, $t(231) = -1.50$, $p > .05$. However, the mean scores suggest a tendency for engineering students ($M = 11.12$, $SD = 3.87$) to exhibit a more external locus of control compared to healthcare professionals ($M = 10.37$, $SD = 3.65$). The effect size was small, indicating that the observed difference was not substantial.

A statistically significant difference was found in empathy scores between the two groups, $t(231) = 2.37$, $p < .05$. Healthcare professionals ($M = 32.88$, $SD = 4.29$) scored higher on empathy than engineering students ($M = 31.40$, $SD = 5.23$). The effect size was small, indicating that although the difference was statistically significant, its magnitude was limited.

H5. Machiavellianism and psychopathy differ as a function of age.

A one-way ANOVA was performed to assess differences in Machiavellianism and psychopathy across three age groups: younger adults, middle-aged adults, and older adults.

The analysis revealed significant age-group differences in Machiavellianism, $F(2, 230) = 12.71$, $p < .001$, $\eta^2 = .10$. Levene's test indicated a violation of the homogeneity of variance assumption, $F(2, 230) = 4.45$, $p < .05$; therefore, Dunnett's T3 post hoc test was used. Results showed that younger adults ($M = 29.37$, $SD = 4.23$) scored significantly higher than both middle-aged adults ($M = 26.49$, $SD = 6.13$, $p < .05$) and older adults ($M = 25.01$, $SD = 5.89$, $p < .001$), while no significant difference was observed between the latter two groups ($p > .05$).

The ANOVA revealed a significant effect of age group on psychopathy, $F(2, 230) = 7.52$, $p < .01$, $\eta^2 = .06$. Levene's test indicated that the assumption of

homogeneity of variances was satisfied, $F(2, 230) = 0.77, p > .05$. Tukey post hoc comparisons showed that younger adults ($M = 19.10, SD = 5.18$) scored significantly higher on psychopathy than middle-aged adults ($M = 16.17, SD = 4.56, p < .001$). No significant differences were observed between older adults ($M = 17.33, SD = 4.54$) and either younger or middle-aged adults ($p > .05$).

4. DISCUSSIONS AND CONCLUSIONS

Individuals with higher levels of Machiavellianism tend to perceive life events as being primarily determined by external circumstances rather than by their own actions. Although Machiavellianism is commonly associated with strategic thinking and self-control, individuals high on this trait may be more inclined to attribute both positive and negative outcomes to external factors such as luck, fate, or other people, rather than to personal effort. This finding is consistent with previous empirical research reporting a positive association between Machiavellianism and an external locus of control (Bonfa-Araujo *et al.*, 2021; Baptista *et al.*, 2024; Latif, 2000; Rapp-Ricciardi *et al.*, 2018).

Although narcissism and psychopathy were positively associated with locus of control, these relationships did not reach statistical significance. The core characteristics of narcissism, such as grandiosity and the need for admiration, may partly explain a tendency toward a more internal locus of control, reflecting individuals' belief in their own superiority and their perceived ability to influence life events. However, the tendency to attribute successes internally and failures externally may weaken the overall association with a consistent control orientation.

Although individuals high in psychopathy may display a sense of control over others, their impulsivity and risk-taking behaviors may lead them to externalize responsibility for negative outcomes. The absence of a significant correlation suggests that this tendency is not consistent across individuals. These findings contrast with previous research reporting a stronger association between psychopathy, narcissism, and an external locus of control (Aldousari & Ickes, 2021; Bonfa-Araujo *et al.*, 2021; Sullivan, 2020).

The negative association between psychopathy and empathy may be explained by the difficulties individuals with psychopathic traits have in recognizing and responding to others' emotional states. Reduced empathy may contribute to patterns of emotional detachment, manipulateness, and impulsivity. Although the effect size was modest, this finding is in line with previous research identifying empathic deficits as a core characteristic of psychopathy (Bloxsom *et al.*, 2021).

The third hypothesis, which proposed that Machiavellianism and narcissism predict empathy, was supported. The regression model reached statistical significance, indicating that these traits jointly predict empathy, although a large proportion of the variance remains unexplained. Higher Machiavellianism was associated with lower empathy, consistent with prior research linking this trait to manipulative, self-serving, and emotionally detached behavior (Ali *et al.*, 2009).

The regression analysis revealed a positive association between narcissism and empathy. This finding may reflect adaptive aspects of narcissism, such as the need for approval and the motivation to maintain a positive self-image, which may facilitate apparently empathic behavior. Higher empathy scores may reflect the use of cognitive empathy for strategic purposes, such as social validation or manipulation, rather than genuine emotional concern. These findings are consistent with previous research emphasizing the complex and sometimes adaptive features of narcissism (Das *et al.*, 2015).

Engineering students obtained higher scores on Machiavellianism and psychopathy, suggesting a greater tendency toward manipulateness, cynicism, and lower empathy. In contrast, healthcare professionals showed a greater capacity to understand and anticipate others' emotions. No significant differences were observed in locus of control, although engineering students showed a tendency toward a more external orientation..

The differences observed between the two professional groups may be explained within the framework of person–environment fit and occupational socialization. Engineering environments tend to emphasize logic, efficiency, and problem-solving, where traits such as pragmatism, strategic thinking, and emotional detachment, characteristic of Machiavellianism, may be perceived as adaptive. Certain subclinical psychopathic traits, including risk-taking and low emotional reactivity, may further support innovation and persistence when facing technical challenges. In contrast, medical professions emphasize ethical values, empathy, and patient care, which may attract individuals with stronger altruistic and prosocial tendencies.

From an occupational socialization perspective, the engineering culture's focus on productivity, innovation, and technical problem-solving may reinforce pragmatic and strategic behaviors associated with Machiavellianism. In contrast, medical socialization places greater emphasis on ethical responsibility, empathy, and patient care, thereby fostering prosocial orientations and attenuating manipulative tendencies..

The differences observed between the two groups may reflect not only self-selection processes but also the influence of the specific social and normative expectations associated with each professional context.

The ANOVA results indicated a decrease in Machiavellianism and psychopathy with age. As individuals mature, they gain life experience, become more aware of the consequences of their behavior, and tend to place greater value on long-term relationships and social reputation. Cognitive maturation may also contribute to improved emotional regulation and more adaptive interpersonal functioning. The decline in Machiavellianism appears to be most evident from early to later adulthood, followed by a period of relative stability. These findings are in line with previous research documenting age-related differences in Machiavellianism and psychopathy (Birkás *et al.*, 2018; Čopková, 2022; Götz *et al.*, 2020; Hartung *et al.*, 2022; Klimstra *et al.*, 2020; Makim & Shetty, 2018).

5. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

A major limitation of the present study concerns the unequal composition of the two participant groups, which included both employed professionals and students. The groups were selected primarily based on convenience, which restricts the possibility of direct comparison between professional fields and provides only a preliminary understanding of the observed differences. In addition, the study examined only two professional domains, limiting the generalizability of the findings to other occupational contexts.

Future studies should include participants with comparable educational backgrounds and investigate additional fields in which personality traits and empathy may play an important role, such as education, law, or politics.

These findings underscore the importance of considering individual psychological characteristics in the development of vocational training and personnel selection programs..

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