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Dark and Light Triad: A cross-cultural comparison of network analysis in 5 countries☆

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ABSTRACT

Personality clusters such as the Dark and Light Triad are going through an exponential investigation. The Dark Triad traits characterize behaviors associated primarily with socially undesirable outcomes, while the Light Triad traits are composed of behaviors linked to prosocial responses. Most studies that sought to map and investigate both triads are performed in North American or European contexts. Thus, we analyzed the structure of two of the most used short composite measures (i.e., Dirty Dozen and Light Triad Scale) in a sample of 2335 adults from Poland, Brazil, Nigeria, Colombia, and Peru. We performed structural equation models to understand better the structure of both instruments in the five countries. Subsequently, we conducted a network analysis to observe the dynamics of both triads in countries with different cultures. Our results found that Machiavellianism is one of the more relevant traits in Latin American and European countries, while humanism is in Nigeria. Other findings reaffirm that light and dark are not opposite traits, but at the same time, they represent distinct constructs.

1. Introduction

Personality traits can be considered relatively stable patterns of behaviors, thoughts, and feelings (Allemand & Flückiger, 2022). Personality investigation has a long tradition in psychology, culminating in the proposal of theoretical models and measures with different emphases or perspectives (Roberts & Yoon, 2022). From the perspective of socially undesirable traits, the Dark Triad (Paulhus & Williams, 2002) and the Dark Tetrad (Međedović & Petrović, 2015) have been highly investigated. Both consider the dimensions of Machiavellianism (i.e., behaving

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in a cold, manipulative, and exploitative manner with others), narcissism (i.e., self-perception of greatness and feeling entitled to dominate others), psychopathy (i.e., characterized by insensitivity, lack of empathy or remorse, and a tendency to impulsivity), while only the tetrad has the sadism dimension (i.e., pleasure in observing the suffering of others, whether physical or psychological). Although these qualities are socially undesirable (Paulhus & Williams, 2002), they are also considered non-pathological or subclinical because people with such traits can live and function in society without having significant problems (Halty & Prieto, 2011). Nonetheless, they can also bring other types of difficulties, mainly interpersonal, such as isolation, lack of self-control (Copez-Lonzoy et al., 2020), partner infidelity (Jonason & Kavanagh, 2010; Unrau & Morry, 2019), negative attitudes in the work context (O'Boyle et al., 2012; Salessi & Omar, 2018), aggressiveness, and low levels of well-being and unethical conduct (Muris et al., 2017). There are two short composite instruments that have been developed to measure the Dark Triad: the Dirty Dozen (Jonason & Webster, 2010) and the Short Dark Triad (Jones & Paulhus, 2014).

The newest perspective for positive personality traits is the Light Triad (Kaufman et al., 2019), which encompasses aspects such as empathy (i.e., understanding and responding to the feelings of others), compassion (i.e., concern for others when they are in trouble), altruism (i.e., believing that it is right to help others and feeling good afterward; Johnson, 2018), Kantianism (i.e., treating others as an end, not as a means), faith in humanity (i.e., believing that people are essentially good), and humanism (i.e., appreciating the dignity and worth of people). Two composite instruments have been developed to measure the light side of personality: the Light Triad Scale (LTS; Kaufman et al., 2019) and the Light Triad Scale-3 (LTS-3; Johnson, 2018). The first comprises three traits (i.e., Kantianism, humanism, and faith in humanity). The second responds to a second-order structure with three specific dimensions (i.e., altruism, compassion, and empathy) and a general one called prosocial personality. The psychometric properties of both scales are still understudied in other populations and languages. The LTS was adapted for the Polish, Serbian, Turkish, and Brazilian contexts (Barros et al., 2022; Gerymski & Krok, 2019; Lukić & Živanović, 2021; Tekeş & Biçaksiz, 2021), while the LTS-3 had its structure analyzed in the Iranian context (Farah Bijari et al., 2022).

Gender, language, political, economic, and ecological factors are known to influence the personality traits of the Big Five (Church, 2016; Costa et al., 2001; Rentfrow, 2014) and the Dark Triad (Jonason et al., 2020; Muris et al., 2017; Rogoza et al., 2021). On the one hand, in political contexts, the Dark Triad traits manifest as callous and power-seeking people who employ manipulation, self-enhancement, and disregard for moral principles. People with higher levels in the Dark Triad have been shown to exploit others for personal gain and exhibit a lack of empathy or concern for the well-being of others (Bonfá-Araujo et al., 2022). Regarding economic factors, socially undesirable traits influence the behaviors of people, which in turn affects organizations. For example, Machiavellians are opportunistic and use manipulative tactics in business transactions, while narcissistic people seek excessive self-promotion and disregard ethical considerations, and psychopaths lack remorse or empathy, which potentially leads to exploitative practices (Muris et al., 2017; O'Boyle et al., 2012). On the other hand, people who possess high levels of Kantianism, humanism, and faith in humanity are likely to exhibit strong moral principles, empathetic attitudes, and a belief in the inherent worth and potential for growth in others; thus, they may engage in acts of kindness, cooperation, and social responsibility (Bowen et al., 2022; Kaufman et al., 2019).

Generally, the male sex has a higher score in all the traits of the Dark Triad, but there are differences by culture (Jonason et al., 2020). Men have a greater tendency to score high on dark traits than women, especially in psychopathy, followed by Machiavellianism and narcissism, although such gaps may be larger or smaller depending on the country (Muris et al., 2017). Along the same lines, narcissism was lower in more democratic, less corrupt, and more peaceful countries; Machiavellianism was greater in countries with less gender inequality and greater sociopolitical development, such as New Zealand and Singapore, while psychopathy was greater in men from more peaceful countries with more gender equality, such as Croatia and Germany (Jonason et al., 2020). Cultural setting plays an important role in shaping the prevalence and manifestation of the Dark and Light Triad traits. Cultural values, norms, socioeconomic conditions, and historical experiences have been shown to influence the manifestation and acceptance of these traits (Peterson & Palmer, 2021). For instance, in cultures that prioritize individualism, the Dark Triad traits may be more predominant and tolerated, whereas cultures emphasizing collectivism may facilitate the development of the Light Triad traits. This would mean that political, economic, and ecological factors within a culture can both shape and be shaped by the manifestation of socially undesirable/desirable traits (Church, 2016; Ma et al., 2021).

Although the Light Triad seems to emerge as the counterpart of the Dark Triad, both constructs are not merely opposites (Kaufman et al., 2019). One of the reasons for this is the low correlations between the dimensions of each scale (Gerymski & Krok, 2019; Kaufman et al., 2019; Lukić & Živanović, 2021). Another argument in favor of this idea is that the presence of a light side does not necessarily imply the absence of a dark side (Gerymski & Krok, 2019). In fact, due to the flexibility of the personality (Allemand & Flückiger, 2022), no one exhibits totally "dark" or "light" behaviors, feelings, or thoughts (Kaufman et al., 2019; Neumann et al., 2020), as each of them could be adaptive depending on the circumstances (Paulhus, 2014). In this sense, it can be mentioned that the dark side of the personality is a set of behavior patterns, thoughts, and feelings that seek benefit at the expense of others, while the light side refers to such patterns but focuses on benefits and help towards others, for which it is linked to self-realization (Kaufman, 2020). However, the operationalization and conceptualization of the Light Triad still require certain adjustments to determine what it means and what other differences it has with respect to the Dark Triad (Lukić & Živanović, 2021).

Previous cross-cultural studies investigating Dark or Light Triad personality traits focused solely on a single triad. According to the available literature, two recent cross-cultural studies on the Dark Triad were identified, but no cross-cultural investigations of the Light Triad were found. The first study explored cultural differences in Dark Triad traits in 16 countries (i.e., Spain, Germany, Italy, Hungary, Switzerland, Belgium, Bosnia-Herzegovina, Poland, United States, Chile, China, Qatar, Israel, Tunisia, Senegal, and Togo), where it was found that between 6 % and 16 % of the variation between traits was due to the influence of culture (Aluja et al., 2022). Along these same lines, a recent network analysis study that explored the core network of dark personality traits (i.e., Dark Triad, aggressiveness, antagonism, selfishness, Light Triad, honesty-humility, and emotional intelligence) reported in its network structure that Light Triad traits were negatively related to Dark Triad traits (Dinić et al., 2021). However, this study only included adults from the general population of a single country (i.e., Serbia), making it necessary to determine their conditional association based on the culture of different countries.

Thus, the main objective of our research is to analyze the relationships that exist between the light and dark traits of personality through network psychometrics, which allows inferring psychological attributes through a dynamic and complex system from data. The resulting graph is a set of nodes interconnected by edges and, in accordance with its matrix derived from the initial analysis, can be directed or undirected (Isvoranu et al., 2022). Specifically, undirected network models that include both personality types are performed for each country, exploring core traits and comparative network analyses. According to the information available, the objective of the research is justified for the following reasons: (a) Although there are studies that have examined the relationships between the Light and the Dark Triad independently or together with several countries, these are carried out mostly in countries belonging to Europe and North America (Dinić et al., 2021; Jonason

et al., 2020). However, there are still no cross-cultural studies with the participation of countries from Latin America, Europe, and Africa together. The findings of this study would contribute to this knowledge gap, given the inclusion of countries such as Peru, Colombia, and Nigeria, which are usually absent in cross-cultural research on personality; (b) Previous studies (Jonason et al., 2020; Rogoza et al., 2021) have used models based on Structural Equation Modeling (SEM), which have some limitations when studying personality, since, from this paradigm, it is conceived as a latent variable, where thoughts, feelings, and behaviors are grouped into a specific personality trait because they share a common cause (Borsboom et al., 2021). Instead, from the perspective of network analysis, the representation of the Dark and Light Triad may emerge from the interaction of their lower-level (i.e., one-dimensional) antisocial and prosocial traits considered basic units according to the taxonomic model of personality (Condon et al., 2020), which can be grouped into systemic network structures (Borsboom et al., 2021; Cramer et al., 2012) for they reinforce each other in a systemic covariance structure. From this approach, personality variables are not recognized as latent entities that cause the emergence and relationship of personal traits. On the contrary, they are conditional associations between themselves, which represent such personality traits (Borsboom & Cramer, 2013; Costantini et al., 2019). In this sense, network models based on the estimation of covariance and statistical interactions in a Pairwise Markov Random Field (PMRF) can provide useful information for the study of conditional associations between traits, individual or positive and negative domains of the complex phenomenon of personality (Costantini, 2014; Costantini et al., 2019; Costantini & Perugini, 2012). Finally, (c) through a cross-cultural study, it would be possible to know to what extent the model of the Light Triad and its relationship with the Dark Triad can be generalized to different cultures.

2. Method

2.1. Participants and procedures

The overall sample consisted of 2335 adult participants with a mean age of 26.05 years (range = 18–80 years, $SD = 9.24$). The sample size for each country was $n = 398$ for Poland ($M_{age} = 29.14$), $n = 444$ for Brazil ($M_{age} = 27.69$), $n = 473$ for Nigeria ($M_{age} = 22.85$), $n = 491$ for Colombia ($M_{age} = 24.76$), and $n = 529$ for Peru ($M_{age} = 26.38$). All countries had a higher number of female participants, except for Nigeria (i.e., 130 men and 268 women in Poland; 67 men and 377 women in Brazil; 320 men and 153 women in Nigeria; 204 men and 287 women in Colombia; 248 men and 281 women in Peru). We had a total of 1366 women (58.5 %) and 969 men (41.5 %). Regarding sociodemographic aspects, such as academic degrees, we identified that the majority were university students ($n = 1743$), $n = 194$ participants were employed, and $n = 398$ did not report any type of academic information. Regarding marital status, $n = 1329$ were single, while $n = 164$ had a partner, and $n = 842$ did not report any information about marital status.

The primary data for each sample were collected by local researchers interested in the present study. Data were collected in 2020 in Poland and Brazil, while in Colombia, Peru, and Nigeria in 2022, respectively. The surveys were distributed through different online platforms such as Facebook and WhatsApp through Google Forms, following the ethical standards according to each cultural context and in accordance with the guidelines of the Declaration of Helsinki about informed consent, confidentiality of information, and dignified treatment of participants.

2.2. Measures

To assess the Dark Triad, we used the Dirty Dozen scale (DD; Jonason & Webster, 2010) adapted to all countries. It is composed of 12 items, four for each trait (i.e., Machiavellianism, narcissism, and psychopathy). Participants responded on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The DD previously showed adequate validity evidence (i.e., factor analysis and measurement invariance) in all the countries assessed in this study (see Rogoza et al., 2021).

To assess the Light Triad, we used the Light Triad Scale (LTS; Kaufman et al., 2019) adapted to all countries. It is composed of 12 items, four for each trait (i.e., faith in humanity, humanism, and Kantianism). Participants responded on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The LTS was previously validated in the Brazilian and Polish contexts (Barros et al., 2022; Gerymski & Krok, 2019). Thus, we carried out the translation for the LTS in the other three countries (i.e., Colombia, Nigeria, and Peru). The initial translation was reviewed in collaboration with two other researchers: Disagreements and differences were discussed as a group to refine the scale in both languages (i.e., Spanish and English), specifically to adapt the instrument to the South American and Nigerian context. Cross-linguistic equivalence was achieved with the back-translation (Colina et al., 2017; Klotz et al., 2023), which allowed us to check for discrepancies with the original scale and to obtain the final versions to proceed with the data collection.

2.3. Data analysis

It is essential to recognize that dark and light traits have similar characteristics of interpersonal orientation but, at the same time, differ in other affective and motivational attributes (Kaufman et al., 2019; Michels & Schulze, 2021). Therefore, to analyze the particularity of these domains, the use of partial relationships is recommended, which control the shared variance of the study variables (Epskamp & Fried, 2018). In the psychological network model, the partial relationships presented are more genuine since they go through a regularization filter where those that are spurious are eliminated. This allows for maximizing the probability of reporting the strongest relationships (Borsboom et al., 2021; Ramos-Vera, 2022). The use of this multivariate methodology makes it possible to verify the independent contribution of one variable to another (i.e., independent conditional relationships) through a series of associations without removing information on their covariances (see Waldorp et al., 2019 for a more detailed explanation).

Scale scores were modeled using the Exploratory Structural Equation Model (ESEM), Confirmatory Factor Analysis (CFA), and Structural Equation Model (SEM). The Unweighted Least Squares (ULS) estimator was used for its effective compensation and bias correction in general models for ordinal indicators in modeling SEM (Li, 2016). In the case of the ESEM models, these were rotated with geomin (Asparouhov & Muthén, 2009; Browne, 2001; Marsh et al., 2014). To determine the plausibility of the simple structure for the models, the following indicators were used: if the parameters of the ESEM model and its corresponding CFA are equivalent and the fit of the CFA was similar or better than the ESEM, the simple structure, corresponding to the model optimal, will be determined by the CFA. In contrast, if the parameters of the ESEM and CFA models were different and the fit of the ESEM was better than that of the CFA, the factorial structure would be considered complex, and the ESEM model would be chosen as the optimal model (Asparouhov & Muthén, 2009; Garrido et al., 2018; Marsh et al., 2014). The adjustment of the factorial models was found through three indices: Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error Of Approximation (RMSEA). CFI and TLI values greater than or equal to 0.90 and 0.95 suggest an acceptable and excellent fit to the data, while RMSEA values <0.08 and 0.05 may indicate a reasonable and close fit to the data (Hu & Bentler, 1999; Marsh et al., 2004; Schreiber et al., 2006). In the case of the SRMR, a value less than or equal to 0.08 indicates a good fit for the data (Hu & Bentler, 1999; Schreiber, 2017).

Subsequently, we carried out a network analysis for each country to observe the dynamic behavior of the variables in the different countries. Partial correlation metrics were obtained, where the relationships between the nodes can be positive or negative; the centrality was analyzed

through the expected influence to see the importance of the nodes individually. Finally, the predictabilities were obtained to determine how predicted a node can be by the other nodes. The network index makes it possible to identify those items that present a higher degree of conditional relationship with the other elements of the system beyond the global multivariate control of the network connections (Ramos-Vera et al., 2022; Ramos-Vera et al., 2023). After analyzing the networks individually, the most similar networks were joined to form a general network with the same metrics.

The data were analyzed in R studio, and the ESEM analysis was executed with three packages: psych version 2.2.5 (Revelle, 2022), lavaan version 0.6-12 (Rosseel, 2012), lavaanPlot version 0.6. 2 (Lishinski, 2021). The fa function of the psych package was used to perform the Exploratory Factor Analysis (EFA), and geomin rotation was used; the explored loads were analyzed to obtain the anchors, and the loads and the anchors were processed by means of a function created to analyze the ESEM model. The model obtained was processed with the cfa function of the lavaan package to obtain the fit indices and the standardized loads with the ULS estimator. Finally, the model was plotted with the lavaanPlot function from the package with the same name. The obtained graphs are available in the supplementary data (https://osf.io/epyg4/).

The individual and general network structures were analyzed with the qgraph version 1.9.2 (Epskamp et al., 2012) and bootnet version 1.5 (Epskamp & Fried, 2021) packages; the estimateNetwork function of the bootnet package was used to calculate the network models, the ggmModSelect modeling was used with the npn correlation method, which applies non-paranormal transformations to help relax the assumption of normality (Liu et al., 2009). Centralities were analyzed with the centrality Table function and plotted with the centralityPlot function, with the values converted to the standardized coefficients, or z-scores, contained in the qgraph package.

Finally, a cross-analysis was carried out between the estimated networks of the countries through the NetworkComparisonTest version 2.2.1 package (van Borkulo et al., 2022), with the aim of exploring the differences between the estimated networks, in their axes and centralities, a Bonferroni adjustment was used for the significances, through 100 permutations. The result is expressed in *p*-values with an alpha level of 0.05 (van Borkulo et al., 2022). The similarity of the networks was evaluated through the correlation of the adjacency matrices, which means that if the correlations of the matrices are equal to one, the networks have a perfect linear relationship, suggesting that the networks have the same structure; if the correlations are equal to zero, the networks have no detectable linear correspondence; if the correlations are equal to minus one, the networks are exactly opposite (Borsboom et al., 2017).

3. Results

The countries that obtained the highest scores in the light features were Humanism (L2) in Colombia (M = 17.36), Kantianism (L3) in Poland (M = 15.82), and faith in humanity (L1) in Peru (M = 14.27). At the same time, higher dark trait scores were reported for narcissism (D3) in Nigeria (M = 11.73), psychopathy (D2) in Poland (M = 9.73), and Machiavellianism (D1) in Peru (M = 9.38). In the ESEM, positive results were shown for a solution of three factors in each variable per country, which were confirmed by CFA through structural equations (CFA SEM).

The results of the ESEM for the Light Triad in comparison with the CFA SEMs tested, shown in Table 1, were the models with the best fit. In all models, the three-factor solution was adequate, which confirms the original structure for the Light Triad and the Dark Triad, respectively. Fig. 1 shows the estimated networks of the Dark Triad and the Light Triad. In general, the variables are negatively connected with different intensities according to the country. Among the similarities, there is a weak negative association between Kantianism (L3) and narcissism (D3) (Peru: r = −0.132; Poland: r = −0.230); Machiavellianism (D1) and faith in humanity (L1) (Poland: r = −0.112; Colombia: r = −0.125); psychopathy (D2) and humanism (L2) (Brazil: r = −0.147; Colombia: r = −0.192; Nigeria: r = −0.145). Only a moderate negative relationship was found between Machiavellianism (D1) and Kantianism (L3) (Brazil: r = −0.365).

Table 1
Fit statistics for the ESEM and CFA estimated models.

Model	χ^2/df	CFI	TLI	RMSEA	SRMR
1. Light Triad					
ESEM General	6.80	0.970	0.940	0.050	0.022
ESEM Brazil	1.53	0.983	0.967	0.035	0.025
ESEM Poland	2.85	0.934	0.868	0.068	0.037
ESEM Colombia	1.86	0.977	0.953	0.042	0.024
ESEM Peru	3.15	0.952	0.904	0.064	0.032
ESEM Nigeria	2.58	0.975	0.951	0.058	0.024
2. Dark Triad					
ESEM General	6.23	0.984	0.968	0.047	0.017
ESEM Brazil	2.37	0.976	0.953	0.056	0.023
ESEM Poland	2.38	0.977	0.954	0.059	0.025
ESEM Colombia	2.07	0.983	0.965	0.047	0.021
ESEM Peru	2.77	0.982	0.964	0.058	0.019
ESEM Nigeria	2.74	0.979	0.958	0.061	0.025
3. Light Triad Validation					
CFA General	12	0.965	0.955	0.069	0.058
CFA Brazil	3.13	0.953	0.939	0.069	0.068
CFA Poland	2.34	0.968	0.959	0.058	0.062
CFA Colombia	2.67	0.973	0.965	0.058	0.060
CFA Peru	4.14	0.959	0.947	0.077	0.072
CFA Nigeria	2.49	0.988	0.985	0.056	0.059
4. Dark Triad Validation					
CFA General	23.14	0.961	0.950	0.097	0.081
CFA Brazil	3.75	0.970	0.961	0.079	0.074
CFA Poland	9.30	0.918	0.894	0.145	0.124
CFA Colombia	1.86	0.992	0.990	0.042	0.050
CFA Peru	3.54	0.987	0.983	0.069	0.066
CFA Nigeria	1.61	0.996	0.995	0.036	0.047

Notes. ESEM = Exploratory Structural Equation Modeling; CFA = Confirmatory Factor Analysis; χ^2/df = chi-square by degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error Of Approximation; Model CFA corresponds to Dark Triad and Light Triad theoretical factors; $p < 0.001$ for all chi-square tests.

In general, there were positive triangular relationships between the groups of variables in Peru and Nigeria. In contrast, zero connections were found, which disarticulates the triangularity of the variables in Brazil and Colombia. Poland presented triangular association only in the Dark Triad, while in the Light Triad, it presented zero connection between humanism (L2) and Kantianism (L3). Moderate positive relationships were found between Machiavellianism (D1) and psychopathy (D2) (Brazil: r = 0.348; Colombia: r = 0.388; Nigeria: r = 0.597); Machiavellianism (D1) and narcissism (D3) (Brazil: r = 0.338; Colombia: r = 0.456; Poland: r = 0.433); faith in humanity (L1) and humanism (L2) (Colombia: r = 0.369; Nigeria: r = 0.371; Peru: r = 0.426; Poland: r = 0.428). Only a positive relationship was found between humanism (L2) and Kantianism (L3) (Nigeria: r = 0.464). Finally, a positive weak outlier relationship was found between humanism (L2) and narcissism (D3) (Nigeria: r = 0.183).

According to the predictabilities, generally Machiavellianism (D1), is the variable with the highest index (R2; Peru = 0.57; Poland = 0.45; Brazil = 0.41; Nigeria = 0.52; Colombia = 0.47), followed by psychopathy (D2) slight changes in Poland (R2 = 0.41); Brazil (R2 = 0.29) and Colombia (R2 = 0.31); while the variable with the lowest predictability is Kantianism (L3) (R2; Peru = 0.22; Poland = 0.29; Brazil = 0.27; Nigeria = 0.39; Colombia = 0.09), preceded by humanism (L2) (R2; Peru = 0.33; Poland = 0.21; Brazil = 0.24; Nigeria = 0.48; Colombia = 0.36).

The centralities of the networks in a comparative manner and ordered by their expected influence are presented in Table 2. In general, Machiavellianism has the highest index and is, therefore, more central

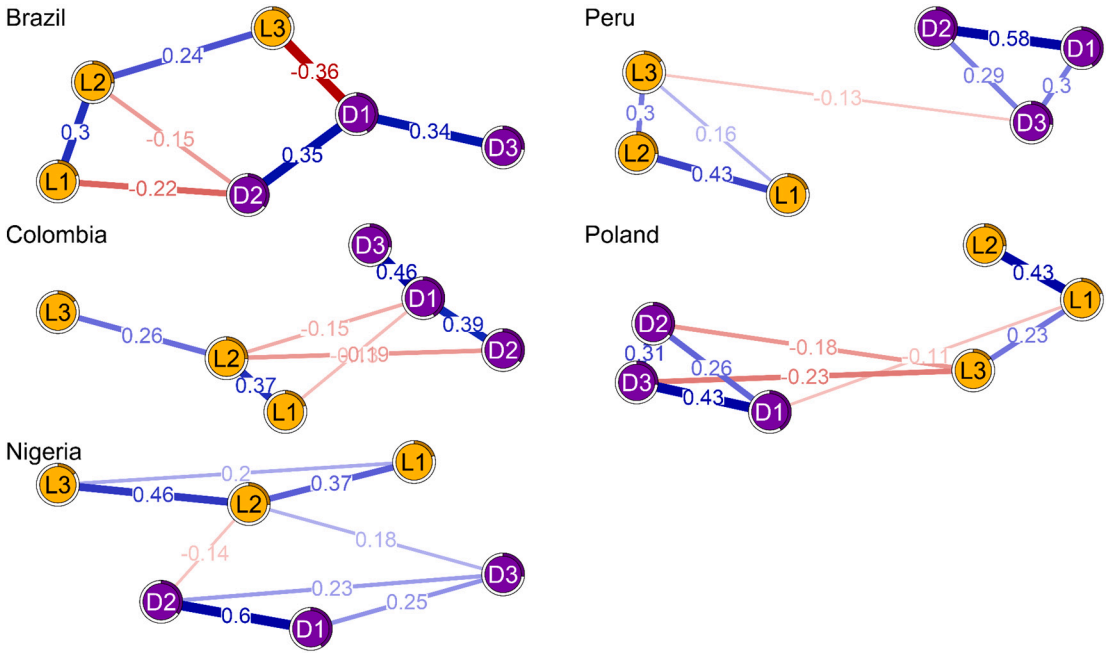


Fig. 1. Dark Triad vs. Light Triad networks by country.
Notes. D1 = Machiavellianism; D2 = Psychopathy; D3 = Narcissism; L1 = Faith in Humanity; L2 = Humanism; L3 = Kantianism; higher ring ratio corresponds to higher predictability (R2).

Table 2
Centrality by expected influence of network graphs.

Expected influence (EI)						
Node	Brazil	Colombia	Nigeria	Peru	Poland	Overall Mean
D1	0.736	1.605	1.122	1.063	0.698	1.045
L2	1.065	−0.366	1.310	0.392	0.169	0.514
D3	0.811	0.854	−0.434	−0.844	0.484	0.174
D2	−0.868	−0.951	−0.299	1.009	0.026	−0.217
L1	−0.428	−0.615	−1.239	−0.231	0.596	−0.383
L3	−1.315	−0.527	−0.461	−1.390	−1.973	−1.133

Notes. D1 = Machiavellianism; D2 = Psychopathy; D3 = Narcissism; L1 = Faith in Humanity; L2 = Humanism; L3 = Kantianism; Overall Mean = General mean by node.

(D1; Overall Mean = 1.045), followed by humanism (L2; Overall Mean = 0.514), while Kantianism has the lowest index and, therefore, least central (L3; Overall Mean = −1.133) preceded by faith in humanity (L1; Overall Mean = −0.383). Individually, as can be seen in Table 2 and Fig. 2, each network presents differences in its centralities. While Machiavellianism (D1) is the most central in Peru (EI = 1.063), Colombia (EI = 1.605), and Poland (EI = 0.698), in Nigeria and Brazil, the most central measure was humanism (L2; EI = 1.310 and EI = 1.065, respectively); followed by Machiavellianism (D1) in Nigeria (EI = 1.122) and Brazil (EI = 0.736), psychopathy (D2) in Peru (EI = 1.009), faith in humanity (L1) in Poland (EI = 0.596), and narcissism (D3) in Colombia (EI = 0.854) and Brazil (EI = 0.811). On the other hand, the lowest individual expected influence indices are found in Colombia with psychopathy (D2; EI = −0.951), in Nigeria with faith in humanity (L1; EI = −1.239), and in Peru (EI = −1.390), Poland (EI = −1.973), and Brazil (EI = −1.315) with Kantianism (L3); preceded by faith in humanity (L1) in Colombia (EI = −0.615), Kantianism (L3) in Nigeria (EI = −0.461), narcissism (D3) in Peru (EI = −0.844) and psychopathy (D2) in Poland (EI = 0.026) and Brazil (EI = −0.868).

The invariance analysis of the networks by country, in Table 3, shows that there are statistically significant differences in all the networks, except in Colombia vs. Nigeria and Peru vs. Nigeria. That is, all the networks are different in the compared samples except for those

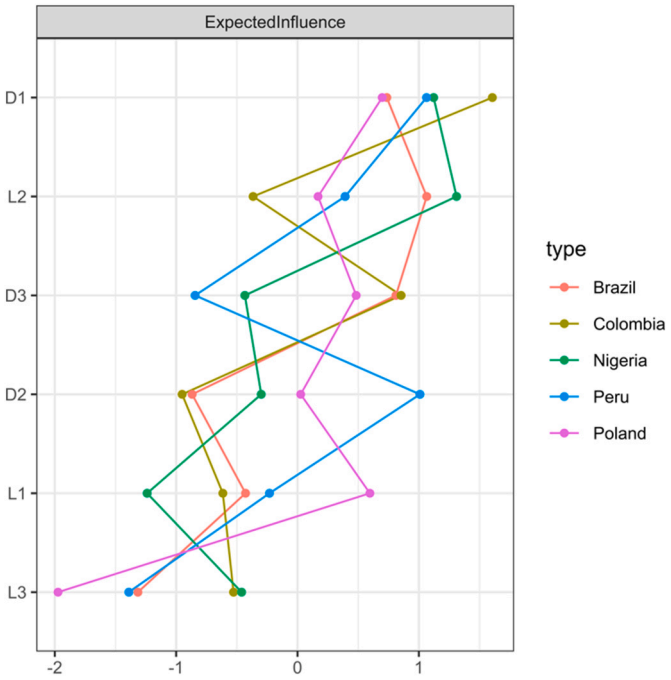


Fig. 2. Expected influence of network graphs.
Notes. D1 = Machiavellianism; D2 = Psychopathy; D3 = Narcissism; L1 = Faith in Humanity; L2 = Humanism; L3 = Kantianism.

mentioned. Regarding the global strength invariance test, only statistically significant differences were identified between Colombia vs. Nigeria and Brazil vs. Nigeria. That is, the connections or density of the network are different between the compared samples. The adjacency matrices were statistically significantly correlated at a moderately high level, with correlations ranging from 0.62 (Poland – Nigeria) to 0.88 (Brazil – Nigeria; Brazil – Colombia), indicating stability in the comparison of the samples. In summary, this demonstrates the existence of

Table 3
Network comparison test based on global strength and network invariance.

Networks		Network invariance	Global strength	Adjacency matrix	
Country 1	Country 2	*p*	*p*	*Spearman*	*p*
Brazil	Colombia	< 0.001	0.83	0.88	<0.001
Brazil	Peru	< 0.001	0.12	0.82	<0.001
Brazil	Poland	< 0.001	0.21	0.77	<0.001
Brazil	Nigeria	< 0.001	0.05	0.88	<0.001
Colombia	Peru	< 0.001	0.06	0.85	<0.001
Colombia	Poland	< 0.001	0.06	0.75	<0.001
Colombia	Nigeria	0.13	< 0.001	0.82	<0.001
Peru	Poland	< 0.001	0.94	0.84	<0.001
Peru	Nigeria	0.23	0.11	0.74	<0.001
Poland	Nigeria	< 0.001	0.59	0.62	<0.001

Note. Global strength refers to the Difference in Expected Influence between networks.

differences between the networks and the expected influence of the countries compared, as well as their stability. Information about differences between the Light Triad and the Dark Triad within countries can be found in the OSF repository.

Finally, a general network was tested, where Nigeria was excluded (Fig. 3) because it presented an inverse heterogeneous relationship between humanism (L2) and narcissism (D3), unlike the other networks. Both variables were internally triangulated positively and negatively related. The moderate positive relationships were between faith in humanity (L1) and humanism (L2; $r = 0.380$), Machiavellianism (D1) and psychopathy (D2; $r = 0.444$), Machiavellianism (D1) and narcissism (D3; $r = 0.319$). While the negative relationships were weak between Kantianism (L3) and narcissism (D3; $r = -0.132$), humanism (L2) and psychopathy (D2; $r = -0.116$), in addition, we found that faith in humanity was not directly related to dark traits in the joint network. Regarding predictabilities, the node with the highest predictability was Machiavellianism (D1; R2 = 0.411), followed by psychopathy (D2; R2 = 0.347), while the lowest predictabilities were for Kantianism (L3; R2 = 0.155), preceded by faith in humanity (L1; R2 = 0.201). In the centrality measured by the expected influence, the nodes with the highest score were Machiavellianism (D1; EI = 1.063), followed by faith in humanity (L1; EI = 0.635). In contrast, Kantianism (L3; EI = −1.771) was the lowest of all, preceded by narcissism (D3; EI = −0.281).

4. Discussion

In this study, we aimed to investigate the direct relationships of light and dark personality traits through network psychometrics in five samples with diverse cultural and sociodemographic backgrounds that considered the participation of Latin American countries together with countries from Europe and Africa (i.e., three countries from Latin America and one from Europe and Africa, respectively) since the backgrounds that have examined the cultural differences of these traits have focused mainly on Europe and North America.

Machiavellianism was the most central measure in three (i.e., Colombia, Peru, and Poland) of the individual samples and in the general network of countries. That is, it had a greater influence on the other variables in the network. The explanation for such findings can be found in the sociopolitical factors of each country and the characteristics of its inhabitants. Thus, Machiavellianism may be more relevant in the nations evaluated because they have a more collectivist culture (Poland showed the lowest results; Jonason et al., 2020), where people see themselves as part of a community, and therefore there is a greater sense of collaboration and affiliation with others (Neumann et al., 2020), which encourages Machiavellian traits to be an opportunity to use social resources and obtain benefits or achievements (Ma et al., 2021). This makes sense in less developed countries (i.e., such as the ones from Latin America included here), where there are high levels of poverty, crime, insecurity, or adverse social events. It has been shown that Machiavellianism can be functional in the sense that they adapt opportunistically because it is characterized by the desire for greater power and economic achievement, which fosters greater competitiveness and strategies with the aim of achieving what is desired short-term based on unethical and socially aversive practices (Lyons & Aitken, 2010; Muris et al., 2017; Tahir et al., 2020). In South American countries, low scores are evident in long-term orientation. That is, adults in South America report a predisposition to avoid social and political changes and maintain practices to achieve short-term goals through illegal or immoral means, which are socially accepted (Hofstede, 2023).

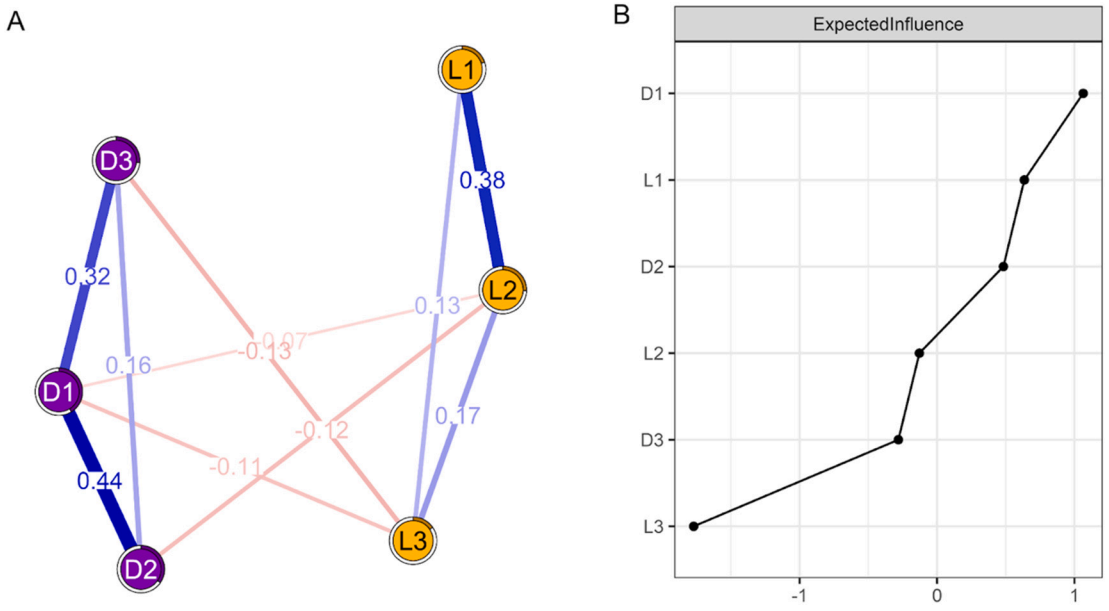


Fig. 3. General network and centrality for Peru, Poland, Brazil, and Colombia.
Notes. D1 = Machiavellianism; D2 = Psychopathy; D3 = Narcissism; L1 = Faith in Humanity; L2 = Humanism; L3 = Kantianism; (A) Network in which edge weights reflect the relative strength of an association; (B) Centrality plot based on Expected Influence = sum of all edges extending from a given node, where the sign of each edge is maintained.

We also found a high general score in narcissism; therefore, it is likely that the participants tend to base their independence and autonomy on a high ego and disproportionate self-esteem, which reinforce greater beliefs and feelings of personal worth, and even report a high degree of benevolent and prosocial qualities (Jonason et al., 2017). Especially if it is considered that the sample of this study is mostly composed of university students, who report a greater desire to obtain prestige and admiration from others for they have a greater need to seek social and employment status; therefore, this condition could influence greater narcissism (Grubbs et al., 2022). Political systems that reward Machiavellian tactics or narcissistic self-promotion may inadvertently promote the prevalence of Dark Triad traits among men and women seeking power. Economic structures that prioritize short-term gains over long-term sustainability may be conducive to exploitative behaviors associated with the Dark Triad. Similarly, ecological factors such as resource scarcity or environmental degradation can influence the competition and cooperation dynamics, consequently affecting the expression of both the Dark and Light Triad traits.

Furthermore, for the lighter traits, the results in each network indicated that humanism was associated with Kantianism and faith in humanity, which has been reported in previous studies (Lukić & Živanović, 2021; Tekeş & Biçaksiz, 2021). This may be because Kantianism is based on the idea that human beings should act in such a way that their behavior honors the dignity of people and is governed by duty, that is, that they do not seek personal benefit through others, those who do not consider others as an instrument to obtain something in return (Kaufman et al., 2019). People with a higher prevalence of Kantianism report behaviors that are universally correct and, therefore, do not act from what is best for them (e.g., I would like to be authentic even if it can damage my reputation). In this sense, a cordial and respectful treatment of others would allow interpersonal relationships to be disinterested. Such findings are also evident in our joint network, shown in Fig. 1.

Other findings of interest are a greater degree of centrality of humanism in Nigeria and Brazil, which indicates that in these countries, there is a tendency towards a greater sense of community, which allows a greater appreciation for human dignity and benevolence with others (Kaufman, 2020; Kaufman et al., 2019). People belonging to countries that have been widely affected by COVID-19, given a large number of infections and deaths, such as Brazil (second country in the absolute number of deaths; World Health Organization – WHO, 2023), can have a social impact of greater consideration for life and human dignity (Wirowski et al., 2022), similarly, in Nigeria, where there is economical and health precariousness, which has even increased in the face of the pandemic because it is a nation identified by a high family community and religious sense oriented towards humanism (Kitause & Achunike, 2013). In addition, in this African context, higher rates of indulgence and optimism have been reported that favor a better development of respect and integrity of the person because they have a culture characterized by greater loyalty and social belonging (Hofstede, 2023), which can promote a greater motivation to recognize the feelings of others and avoid acting based on revenge or disrespect (Gergen, 2015).

The lack of true association between narcissism and humanism was indicated in the joint network and in most networks (i.e., Fig. 1), reinforcing the absence of covariance between such traits (Lukić & Živanović, 2021; March & Marrington, 2021; Tucaković et al., 2022). However, in the Nigerian network, a positive relationship between narcissism and humanism was present. Such finding has also been reported in previous studies from North America and Europe (Grežo & Adamus, 2022; Peterson & Palmer, 2021; Sevi et al., 2020; Tekeş & Biçaksiz, 2021). However, such antecedents considered participants with a higher mean age than the Nigerian sample ($M_{age} = 22.56$). One factor explaining the results may be a larger sample of men because it has been reported that men tend to score higher in dark personality traits, regardless of age, although these differences with respect to women are usually low (Sevi et al., 2020) because men tend to be less empathetic, more competitive, and socially dominant (Muris et al., 2017). Another possible explanation for the association between narcissism and humanism in Nigeria is the fact that in collectivist societies, collaboration is an essential part of relationships and seeks to promote the well-being of all members, which is based on the belief that others deserve to live with justice, dignity, and respect (Kaufman et al., 2019). In this sense, helping and receiving the approval of others for the works in favor of the community could generate positive feedback towards the belief that one is better or superior to others since this generates admiration on the part of the members of the community and their society (Morf et al., 2011). Given that in these contexts, people with a greater social commitment tend to be admired, they may report greater narcissism (Grubbs et al., 2022). Such a finding is evident given that the Nigerian participants reported higher narcissistic scores compared to the other countries.

Faith in humanity was not directly related to narcissism in all networks in each country and the joint network. These results follow the trend of recent research (Bowen et al., 2022; March & Marrington, 2021; Tucaković et al., 2022). A possible explanation for this pattern of results is that faith in humanity does not imply showing benevolent behavior but believing that others have positive aspects despite showing their malevolent side, therefore denoting a more realistic perception of others (Preston-Roedder, 2013; Tweed et al., 2021). This trait is absent in narcissism because the narcissistic person is characterized by exaggerating positive traits and overestimating aspects of their own such as their intelligence, attractiveness, and even kindness explicitly; that is, it focuses on extolling what is positive about himself in order to avoid appearing vulnerable to the idea that they may also have imperfections or socially unaccepted behaviors (Morf et al., 2011).

Among the limitations of the study, the fact that it follows a cross-sectional design is the main one, which prevents us from knowing the way in which personality traits interrelate over time. In addition, not having selected the samples probabilistically does not allow the generalization of the studies, and the findings are not conclusive. However, the research has the strength of being one of the first to analyze the networks of the Light and Dark Triad, considering countries in Latin America, Europe, and Africa (even though we included only one country from Europe and Africa respectively) together, which makes the findings novel and serves as a relevant background in the study of personality.

Regarding the practical implications, the results indicate that personality traits can be better understood as a system that interacts with each other (Costantini, 2014; Costantini et al., 2019; Costantini & Perugini, 2012). Particularly, in this study, it was detected that the core of these relationships was found in Machiavellianism in all countries except Nigeria; in Nigeria, centrality falls on humanism. Our results further confirm the existence of cultural differences in personality traits due to cultural aspects, political, religious, economic, and others, that need to be considered when country comparisons are made (Aluja et al., 2022; Church, 2016; Costa et al., 2001; Jonason et al., 2020; Muris et al., 2017; Rentfrow, 2014; Rogoza et al., 2021). Knowledge about personality traits and their interactions is vital for clinical applications when aimed at psychological interventions and treatments, as it allows professionals to act based on a broader spectrum of human behavior. Therefore, interventions to improve prosocial thoughts, behaviors, and emotions should give priority to Machiavellianism in the case of Latin American and European countries and to humanism in African countries, such as Nigeria. However, it is relevant to highlight the role played by the sociopolitical or educational context because they are factors that influence people's positive beliefs, emotions, and behaviors. Consequently, psychological interventions are not enough, but social work would also be recommended, such as those proposed by Hudson et al. (2019), which have been shown to be effective for the Dark Triad (Hudson, 2023).

In conclusion, dark and light personality traits are interrelated qualities, so it is assumed that both are part of human nature, although, apparently, Machiavellianism is more relevant in Latin American and European countries, while in Africa, humanism is more central. There

may be differences in each country, so it is advisable to continue with more studies that address these personality traits. From a theoretical point of view, the findings of our study suggest that both light and dark side personality traits are distinct constructs, as has been previously pointed out (Gerymski & Krok, 2019; Kaufman et al., 2019; Lukić & Živanović, 2021). Nonetheless, it is important to note that the conceptualization of personality can be better understood as an interrelationship between its traits, that is, as the interaction and influence they have on each other, for they can be flexible and vary depending on cultural or situational factors (Allemand & Flückiger, 2022), for which, purely prosocial or antisocial aspects are not always shown (Kaufman et al., 2019). However, in the present study, we interpreted the results comparing samples from different nations, and we did not intend to propose diagnoses for the results found. We focused on the advancement and understanding of characteristics between groups with cultural, social, and political characteristics and beliefs that are inarguably different. In any case, it is necessary to carry out more studies that allow a greater understanding of the relationships and differences that may exist in personality in different contexts from a dynamic perspective. Furthermore, as stated elsewhere (March & Marrington, 2021), the traits of both triads can have adaptive or maladaptive functions depending on the context in which they are exhibited.

CRediT authorship contribution statement

Cristian Ramos-Vera: Conceptualization, Methodology, Software, Writing - Original Draft, Supervision.

Angel Garcia O'Diana: Methodology, Software, Writing - Original Draft, Writing - Review & Editing.

Andy Sánchez Villena: Methodology, Writing - Original Draft.

Bruno Bonfá-Araujo: Data collection, Writing - Original Draft, Writing - Review & Editing.

Leonardo de Oliveira Barros: Data collection, Writing - Original Draft.

Ana Paula Porto Noronha: Data collection, Writing - Original Draft.

Andrés Gómez-Acosta: Data collection, Writing - Original Draft.

Willian Sierra-Barón: Data collection, Writing - Original Draft.

Rafał Gerymski: Data collection, Writing - Original Draft.

Roseline Oluwaseun Ogundokun: Data collection, Writing - Original Draft.

Akinbowale Nathaniel Babatunde: Data collection, Writing - Original Draft.

AbdulRahman Tosho Abdulahi: Data collection, Writing - Original Draft.

Emmanuel Abidemi Adeniyi: Data collection, Writing - Original Draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that support the findings of this study are available in OSF with the identifier(s) https://osf.io/epyg4/

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2023.112377.

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