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ADAPTATION AND PSYCHOMETRIC PROPERTIES OF THE SHORT DARK TETRAD IN A PERUVIAN SAMPLE

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The aim of this study was to adapt the Short Dark Tetrad (SD4) to a sample of 617 Peruvian adults. The translated version presented validity evidence based on test content and cultural suitability for the target population. We analyzed reliability and different sources of validity evidence on the SD4 and on a shorter version called Super-Short Dark Tetrad (SSD4). Reliability estimates were adequate for the SD4 measures ω = .72-.89, whereas the SSD4 had lower estimates ω = .66-.79. Factorial structure analyses denoted a questionable fit for the original 4-factor model and an adequate fit for a bifactor model on both SD4 and SSD4. Evidence in favor of strict measurement invariance was found regarding age ($n_{age < 25}$ = 362, $n_{age \geq 25}$ = 255) for both versions while evidence for scalar invariance regarding gender (n_{men} = 264, n_{women} = 353) was found only for the SSD4. Relationship analyses resulted in high consistency between the SD4 and SSD4 scores with the Dark Triad Dirty Dozen, except for the narcissism subscale.

Keywords: Construct validity; Machiavellianism; Psychopathy; Sadism; Narcissism.

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Over the past decade, there has been a substantial advance in personality research, specifically in trait theories (John & Robins, 2021). Personality traits are especially useful because they enable the prediction of relevant life outcomes by defining patterns of behaviors, feelings, and thoughts (Hampson, 2021). In some cases, traits may be socially aversive and related to potentially maladaptive behaviors such as aggression, manipulation, or exploitation (Furnham et al., 2013; Zeigler-Hill & Marcus, 2016). These features are conceptualized as the dark side of personality and constitute a quickly growing interdisciplinary field. Among several dark features, most empirical research targets the Dark Triad traits of narcissism, machiavellianism, and psychopathy (Paulhus & Williams, 2002).

Narcissism is understood as the excessive display of grandiosity and the need for admiration, leading to the belief that one is superior to the rest. It is associated with self-centeredness and a sense of personal entitlement. Similarly, the grandiose identity characteristic of narcissists provides them with satisfaction, so they take advantage of any opportunity that reinforces their identity while at the same time attacking any threat to it (Paulhus & Jones, 2015). Psychopathy is the tendency to act impulsively with a lack of empathy and remorse and a high rate of cruelty and superficial charm (Landay et al., 2019; Paulhus, 2014). This trait is characterized by maladaptive features such as impulsive thrill-seeking, criminal, inconsistent, or self-sabotage behavior. Lastly, the lack of control makes them appear to show no concern for reputation (Jones &

Paulhus, 2011). Machiavellianism is the tendency to manipulate and deceive other people for one's own benefit, usually involving a lack of morality, which can reach extremes such as exploitation (Jonason et al., 2020). Sometimes it is described as strategic manipulation because people with this subclinical trait tend to develop patterns of careful planning and flexible execution of actions in the long term, such as deceptive and manipulative tactics, as well as building alliances and trying to have a good reputation. However, criminal activity or coercion is used only when the benefits are sufficient (Paulhus & Jones, 2015).

Empirical research has demonstrated that the Dark Triad allows the prediction of a wide array of behaviors related to several undesired outcomes, such as impaired social relationships, aggressive tendencies, hostility, a lack of empathy, a tendency to engage in deception, and a willingness to use coercive strategies to obtain desired resources (Zeigler-Hill & Marcus, 2016). Nevertheless, these features do not necessarily imply pathologies, because they can be observed in the general population and are configured in the very nature of human beings (Paulhus & Williams, 2002; Wiggins & Pincus, 1989). It is apparent that all three dark traits share a common core: a high insensitivity to the well-being of others, a lack of empathy, and an irregular socialization pattern characterized by interpersonal problems, isolation, and the willingness to take advantage of others for one's own benefit (Jonason et al., 2020). Given that the dark traits are related but distinct (Dębska et al., 2021; Paulhus & Williams, 2002), the interest is growing in understanding them through an integrative approach rather than separately.

Some authors have argued for the need to extend the model by adding sadism as a fourth trait of the Dark Triad due to the similarity at its core (Chabrol et al., 2009; Paulhus et al., 2020). Subclinical sadism is characterized by a tendency to employ cruel or demeaning attitudes toward other people and to experience pleasure in acting on or witnessing the suffering of others (Jonason et al., 2020). It involves an appetite for cruelty; thus, individuals enjoy the pain, humiliation, and suffering of others (Paulhus et al., 2018). It is the only trait out of the four that implies spending time and energy looking for opportunities to damage others, which sometimes leads to aggression even at one's own expense (Buckels et al., 2013). By adding the fourth trait, the current model is redefined as the Dark Tetrad (Paulhus et al., 2020). The model has been criticized due to the lack of theoretical elaboration (e.g., Blötner & Mokros, 2023). In this sense, extending the original model implies the need to develop new measurement tools that address all four dark traits and further develop the theory. As a response, Paulhus et al. (2020) developed the Short Dark Tetrad (SD4), an extension of the previous Short Dark Triad (SD3) that included items for sadism. Although some work has been published based on the SD4, the scale needs to be translated and adapted to promote cross-cultural research.

The Present Study

The aim of this study is to translate and adapt the SD4 and its shorter versions (SSD4 and Mini SD4) to obtain reliability and validity evidence from a sample of Peruvian adults. Specifically, we aimed to obtain reliability evidence by calculating the Omega coefficient for each factor. For validity evidence based on the internal structure, we compared the fit of three models that were previously tested in the literature: multidimensional correlated 4-factor, hierarchical, and bifactor models. Then, to establish validity evidence based on the relationships with other variables, we tested the relationships between the SD4 and SSD4 measures with the Dark Triad Dirty Dozen (DTDD), a scale that measures the Dark Triad: machiavellianism, narcissism, and psychopathy. The reason behind this analysis is that, according to the American Educational Research Association et al. (2014), if a test measures the same or a similar construct as another previously

studied test, a high relationship between its results is evidence for convergent validity. This approach has been widely carried out in studies regarding the validity of the DTDD and SD3 (e.g., Čopková & Šafár, 2021; Dinić et al., 2018). Furthermore, we considered the relationship between the SD4 scales and the Marlowe Crowne Social Desirability Scale (MCSDS), a measure of social desirability. This approach helps determine if the scores might be biased in case a high correlation is found (Paulhus, 2017). We considered it because previous studies found relationships between socially desirable responses and dark traits (e.g., Kowalski et al., 2018). Next, we addressed the relationship between the SD4 and SSD4 with age, seeing that evidence shows negative relationships between both variables (Kawamoto et al., 2020), an analysis that brings concurrent validity evidence (American Educational Research Association et al., 2014). Lastly, we aimed to provide fairness evidence by assessing measurement invariance regarding gender and age groups, an approach that was previously performed in psychometric studies of dark traits scales (e.g., Blötner et al., 2022; Hartung et al., 2022).

The Latent Structure of the Short Dark Tetrad

Paulhus et al. (2020) claimed that the independent and broad study of sadism may overlap with the dark triad of personality traits and considered it necessary to better define these constructs within a 4-factor multidimensional model. The construction of the Short Dark Tetrad (SD4) started with a series of analyses based on exploratory factor analysis (EFA) on an initial 48-item pool, which resulted in a 28-item measure. A confirmatory factor analysis (CFA) revealed an adequate fit of the multidimensional 4-factor model χ^2 = 1691, $p < .001$; RMSEA = .08; CFI = .88; SRMR = .07, with moderate to high factor loadings (λ = .31-.88) and adequate internal consistency of each subscale (α = .75-.81; ω = .76-.81).

Even though some studies have found similar evidence of an acceptable fit for the 4-factor model (e.g., Furnham & Horne, 2021), others have proposed alternative latent structures. For instance, Blötner et al. (2021) translated the original SD4 into German and replicated the analysis performed by Paulhus et al. (2020) by testing the fit for the 4-factor model. Their results suggested a poor fit $\chi^2(344) = 963.12$, $p < .001$; CFI = .78; RMSEA = .06; SRMR = .07; then, the authors chose to randomly parcel items in three indicators per factor, which resulted in better fit indices $\chi^2(48) = 157.50$, $p < .001$; CFI = .92; RMSEA = .06; SRMR = .04. The authors emphasize that, despite their findings, one should consider that their sample was imbalanced (being predominantly women).

Neumann et al. (2022) sought to analyze the 28-item SD4 factorial structure by comparing the original 4-factor model, a bifactor model based on CFA, and the 4-factor model based on exploratory structural equation modeling (ESEM). The original model showed a poor fit (CFI = .84; RMSEA = .08) with small to moderate factor loadings (λ = .20-.63). The bifactor model showed a better fit than the original model (CFI = .89; RMSEA = .07), with small to moderate factor loadings on the general factor (λ = .07-.58). The ESEM approach is the best fit among the three tested models (CFI = .91; RMSEA = .06), with moderate to high factor loadings (λ = .34-.83). Nevertheless, the ESEM model also showed no negligible cross-loadings on three items ($\lambda \geq$ .30) from the sadism and narcissism subscales on the psychopathy factor, similar to those found on the EFA performed by Paulhus et al. (2020). The authors proposed a reduced 12-item version of the SD4 and tested the original 4-factor model. A CFA revealed a better fit than the three previous models (CFI = .96; RMSEA = .04), with moderate to big factor loadings (λ = .48-.89). Further analyses indicated that measurement invariance held across genders for all four proposed models.

Meng et al. (2022) translated the SD4 into Chinese and developed a shorter 16-item version, the Super-Short Dark Tetrad (SSD4). In a subsequent study, they assessed the factorial structure of the SSD4 based on three alternative models. The original correlated 4-factor model presented a poor fit to the data $\chi^2(98) = 269.98$; CFI = .90; RMSEA = .06; SRMR = .05. The second-order model considered the four factors regressed onto a higher-order factor and showed a similar poor fit $\chi^2(100) = 285.30$; CFI = .89; RMSEA = .07; SRMR = .06. The bifactor model showed an adequate fit $\chi^2(88) = 235.499$; CFI = .91; RMSEA = .06; SRMR = .06, with desirable factor loadings on each factor (λ = .24-.76) and small to moderate loadings on the general factor (λ = .12-.58); despite that, three items from the machiavellianism and narcissism subscales displayed low factor loadings (λ < .20); also, some items had higher loadings on the general factor than on their specific factor, particularly in the psychopathy or sadism subscales. Because the bifactor model was the best fit, the authors tested its factorial invariance regarding gender and age and found evidence for the configural, metric, and scalar invariance in both analyses.

Even though most research on this topic is based on a CFA approach, recent studies have addressed the latent structure of the SD4 using modern alternative models. For instance, Blötner and Beisemann (2022) explored the SD4 through the unidimensional polytomous Graded Response Model (GRM; Samejima, 1997) for each separate subscale. The authors found a good fit of the model for the machiavellianism, narcissism, and psychopathy subscales; nonetheless, the sadism subscale exhibited problems associated with item discrimination and difficulties (i.e., endorsement). In another study, Blötner et al. (2022) examined the SD4 through an ESEM approach. The results showed that the 4-factor structure had a better fit when estimated through ESEM rather than CFA. This occurred because ESEM is a less restrictive model in which factor loadings of items that do not belong to a factor are not restricted to zero. Nevertheless, the sadism items had low factor loadings and substantial cross-loadings with psychopathy.

METHODS

Translation

The translation process followed the International Test Commission's (2017) guidelines for translating and adapting tests.[1] Our multidisciplinary translation team consisted of professional translators, experts in psychometrics and test development, and academics with previous experience in personality assessment. All members were Peruvian, thus proficient in the target language and culture. First, two licensed translators performed an independent forward translation. Then, the team reconciled both translations, considering possible cultural differences in test content and scale development standards (Hedrih, 2020; Rust et al., 2020).

To provide validity evidence based on test content, a panel of 10 reviewers was recruited to perform a rating of each item representativeness of its target dimension of the SD4 and clarity in wording (Sireci & Faulkner-Bond, 2014). The reviewers were academics with previous works on issues related to personality, or scale design and construction. Ratings were analyzed using Aiken's V coefficient (Aiken, 1985) and individual suggestions on changes in item wording were considered for potential modifications. After implementing the suggested modifications, we conducted individual interviews with 22 Peruvian adults of different ages to assess how well the item content is understood by our target population. The vast majority of participants understood most of the items, and a few minor changes were made. The final translated version can be consulted in the Appendix.

Participants and Procedure

The study is based on a sample of 617 Peruvian adults, aged from 19 to 83 years (M = 26.79, SD = 9.96), composed of 42.79% men and 57.21% women. Participants were recruited through an online survey. After giving consent, each participant completed a battery of psychometric tests, including the translated version of the SD4. This study received ethical approval on June 28, 2021, from the Research and Ethics Committee of the Faculty of Psychology of the University of Lima, Peru.

Measures

Short Dark Tetrad (SD4). The SD4 is a 28-item psychometric tool developed by Paulhus et al. (2020), comprising four 7-item subscales regarding machiavellianism, narcissism, psychopathy, and sadism. Items are presented along with a 5-point Likert response scale ranging from 1 = *not at all* to 5 = *very much*, depending on the degree to which each participant agrees with each statement. Alternative shorter versions are the Super-Short Dark Tetrad (SSD4), a 16-item version proposed by Meng et al. (2022), and a Mini 12-item version proposed by Neuman et al. (2021).

Dark Triad Dirty Dozen (DTDD) scale. The Dark Triad Dirty Dozen (DTDD; Jonason & Webster, 2010) is a 12-item measure presented in a 9-point Likert scale format from 1 = *disagree strongly* to 9 = *agree strongly*. Several studies were involved in the construction of the DTDD and the assessment of its psychometric properties. The present study found an acceptable fit for the 3-factor model: $\chi^2(251) = 486.40$; CFI = .93; RMSEA = .12, 90% CI [.11, .13]; SRMR = .07. Reliability estimates were adequate for machiavellianism ω = .84 and narcissism ω = .82, but low for psychopathy ω = .67.

Marlowe Crowne Social Desirability Scale (MCSDS). The Marlowe Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960) is a 33-item measure of social desirability presented in a *true/false* response format. The social desirability bias is defined as the need for individuals to respond in a culturally appropriate way. We used a reduced 13-item short form proposed by Reynolds (1982). The present study found an acceptable fit for the unidimensional model $\chi^2(235) = 90.99$; CFI = .92; RMSEA = .05, 90% CI [.04, .06]; SRMR = .08, with an estimated reliability of ω = .66.

Data Analysis

Reliability estimates were based on the original multidimensional correlated 4-factor model (Paulhus et al., 2020), using polychoric correlation matrices in correspondence with the categorical nature of item responses (Viladrich et al., 2017). The Omega coefficient was calculated using the approach proposed by Green and Yang (2009). A CFA framework was employed to test several models proposed for the SD4, using the Weighted Least Squares with Adjusted Means and Variances (WLSMV) estimator suggested when working with polychoric correlation matrices (Li, 2016). We tested the original multidimensional correlated 4-factor model (Paulhus et al., 2020), a second-order model, and a bifactor model (Meng et al., 2022; Neuman et al., 2022). These models were tested on the original 28-item scale (SD4) and on the shorter 16-item version (SSD4), considering the Tucker-Lewis index (TLI), comparative fit index (CFI), root-mean-square error of approximation (RMSEA), and standardized root-mean-square residual (SRMR). TLI $\geq$ .95, CFI $\geq$ .95, RMSEA $\leq$ .05, and SRMR $\leq$ .06 denoted an excellent fit,

whereas TLI ≥ .90, CFI ≥ .90, RMSEA ≤ .08, and SRMR ≤ .08 pointed to a reasonable fit (Keith, 2019). The mentioned cutscores should be used with caution because the ones proposed by Hu and Bentler (1999) might not be adequate when using the WLSMV estimator (McNeish & Wolf, 2023). A simple structure (Thurstone, 1947) and salient factor loadings ($\lambda > .40$) were expected (Brown, 2015). The average variance extracted (AVE) was estimated as an approach to convergent and discriminant validity; AVE > .50 denotes good convergent validity, and AVE greater than the squared correlation is evidence for discriminant validity (Hair et al., 2019). On bifactor models, we estimated the explained common variance (ECV), percentage of uncontaminated correlations (PUC), and hierarchical Omega (ω_H), for unidimensionality evidence (Rodriguez et al., 2016). Measurement invariance was assessed regarding gender and age groups. Nested models were compared to determine the equivalence of model form (i.e., configural), factor loadings (i.e., metric), items intercepts (i.e., scalar), and items unique variances (i.e., strict) through the incremental indexes ΔCFI, ΔRMSEA, and ΔSRMR (Putnick & Bornstein, 2016; Rutkowski & Svetina, 2014). Values of ΔCFI > .01, ΔRMSEA > .02, and ΔSRMR > .03 indicated significant changes between models (Chen, 2007). Lastly, to establish validity evidence based on the relationships with other variables, we tested the relationships between the SD4 and SSD4 measures with the DTDD, in which high correlations between scales that measure the same construct are expected as evidence for convergent validity (American Educational Research Association et al., 2014). Then, we considered the relationship between the scales and the MCSDS as evidence of the degree to which the scores might be biased toward social desirability (Paulhus, 2017). Finally, we addressed the relationship between the SD4 and SSD4 with age as evidence for concurrent validity (American Educational Research Association et al., 2014). Data and R codes are stored in the Open Science Framework (OSF) repository, available at https://doi.org/10.17605/OSF.IO/YF8DX

Results

Reliability

Results based on the 4-factor model tested on the SD4 suggested adequate reliability estimates for machiavellianism ω = .72, narcissism ω = .79, psychopathy ω = .84, and sadism ω = .89. By testing reliability on the SSD4, estimates for narcissism ω = .79, psychopathy ω = .76, and sadism ω = .78 remained at an acceptable consistency; nevertheless, machiavellianism ω = .66 fell below the recommended threshold of .70 (Kline, 2020). As an additional analysis, we estimated reliabilities for the Mini SD4 based on the 4-factor model with a poor fit $\chi^2(248) = 319.92$, $p < .001$; CFI = .86; RMSEA = .10, 90% CI [.09, .11]; SRMR = .08. Results show an acceptable internal consistency for sadism ω = .77; nevertheless, low estimates were found for machiavellianism ω = .47, narcissism ω = .44, and psychopathy ω = .60. For this reason, the analyses of the version of the Mini 12-item by Neumann et al. (2022) have not been further investigated due to the poor fit and low reliability.

Factorial Structure

Table 1 shows results for the factorial structure analyses based on a CFA approach. The 4-factor model showed a questionable fit for the SD4, with moderate to high factor loadings λ = .27-.83, and

heterogeneous extracted variance AVE = .30-.53 which denotes limitations regarding convergent and discriminant validity. Similar results were found for the SSD4 with high factor loadings λ = .50-.88 and AVE = .37-.52. The second-order model had the lowest fit among all proposed models; it also showed a poor fit for the SD4 with low to high factor loadings on the first-order factors λ = .20-.83 and the second-order factor λ = .16-.90. On the contrary, the model presented an adequate fit when tested on the SSD4 with high factor loadings on the first-order factors λ = .51-.87, though the second-order factor had negligible relationships λ = .03-.94, specifically with narcissism. The bifactor model had the best fit among all three proposals. Nevertheless, the SD4 bifactor model had four items with negligible relationships to the general factor; the rest were from small to high, λ = .12-.73. Results from measures of the strength of the general factor show deviations from unidimensionality ECV = .47; PUC = .78; ω_H = .68. Similar results were found on the SSD4, because three items had negligible relationships to the general factor, and the rest were small to high λ = .20-.80. Results from measures of the strength of the general factor were ECV = .41; PUC = .80; ω_H = .60. The 4-factor and bifactor models for both SD4 and SSD4 are presented in Figure 1. All factor loadings of the 4-factor and second-order models were statistically significant; only the bifactor models presented some nonstatistically significant factor loadings, either in the general or the sadism factor.

TABLE 1
Factorial structure of the SD4 and SSD4

Scale	Model	$\chi^2(df)$	TLI	CFI	RMSEA (90% CI)	SRMR
SD4 (28 items)	4-factor	1821.53*** (344)	.83	.85	.08 [.08, .09]	.09
	Second-order	1976.16*** (346)	.82	.83	.10 [.08, .09]	.10
	Bifactor	1360.31*** (322)	.87	.89	.07 [.07, .08]	.07
SSD4 (16 items)	4-factor	506.27*** (980)	.90	.92	.08 [.08, .09]	.07
	Second-order	523.84*** (100)	.90	.91	.08 [.08, .09]	.08
	Bifactor	415.79*** (880)	.91	.93	.08 [.07, .08]	.06

Note. SD4 = Short Dark Tetrad; SSD4 = Super-Short Dark Tetrad; *df* = degrees of freedom; TLI = Tucker-Lewis index; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; CI = confidence interval; SRMR = standardized root-mean-square residual.
***$p < .001$.

Measurement Invariance

Measurement invariance regarding gender (n_{men} = 264, n_{women} = 353) and age ($n_{age < 25}$ = 362, $n_{age \geq 25}$ = 255) was tested for the bifactor models proposed for both SD4 and SSD4; Table 2 displays the results. Mixed results were found on the SD4 ΔCFI > .01; ΔRMSEA < .02; and ΔSRMR < .03, denoting only evidence for configural invariance, whereas evidence for configural, metric, and scalar measurement invariance was observed for the SSD4. Additionally, no significant differences were found in all nested models regarding age for both scale versions, thus suggesting support for configural, metric, scalar, and strict invariance based on age groups.

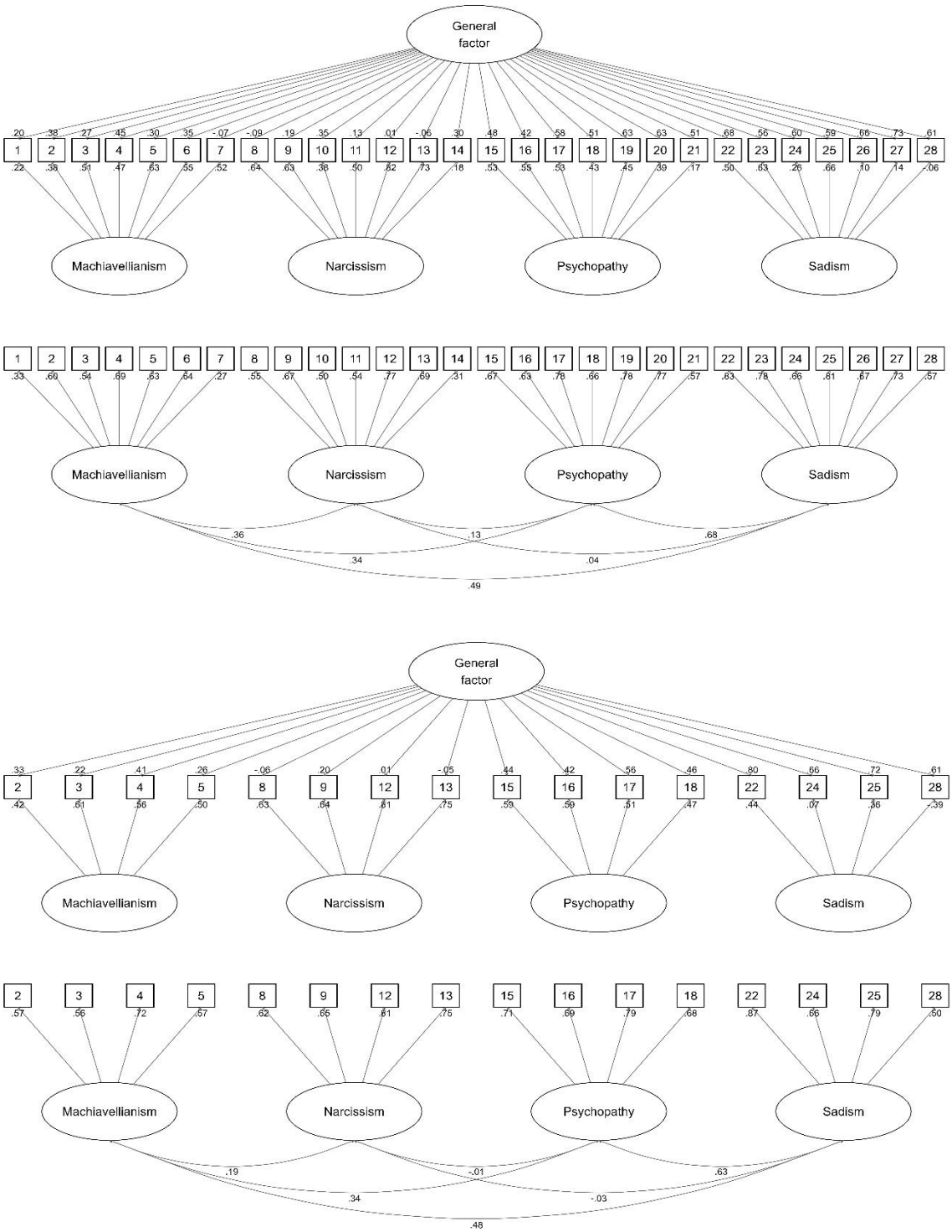

FIGURE 1
Factorial structure of the SD4 and SSD4

TABLE 2
Fit measures of nested models: Configural, metric, scalar, and strict invariance

Scale	Group	Model	$\chi^2(df)$	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR
SD4	Gender	Configural	1252.22*** (644)	.85		.06		.07	
		Metric	1345.52*** (695)	.84	.01	.06	.00	.08	.01
		Scalar	1435.36*** (718)	.82	.02	.06	.00	.08	.00
		Strict	1680.77*** (746)	.77	.06	.07	.01	.08	.01
	Age	Configural	1213.98*** (644)	.87		.06		.06	
		Metric	1268.26*** (695)	.87	.00	.06	.00	.07	.01
		Scalar	1331.14*** (718)	.86	.01	.06	.00	.07	.00
		Strict	1365.11*** (746)	.86	.00	.06	.00	.07	.00
SSD4	Gender	Configural	417.54*** (176)	.88		.07		.06	
		Metric	421.67*** (203)	.89	.00	.06	.01	.06	.00
		Scalar	446.56*** (214)	.88	.01	.06	.00	.07	.00
		Strict	539.86*** (230)	.84	.04	.07	.01	.07	.01
	Age	Configural	373.10*** (176)	.91		.06		.06	
		Metric	400.22*** (203)	.90	.00	.06	.00	.06	.01
		Scalar	428.55*** (214)	.90	.01	.06	.00	.06	.00
		Strict	442.09*** (230)	.90	.00	.06	.00	.07	.00

Note. SD4 = Short Dark Tetrad; SSD4 = Super-Short Dark Tetrad; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; CI = confidence interval; SRMR = standardized root-mean-square residual; ΔCFI = change in CFI; ΔRMSEA = change in RMSEA; ΔSRMR = change in SRMR.
***$p < .001$.

Validity Evidence Based on the Relationships with Other Variables

Relationships between the SD4, SSD4, and DTDD dimensions are presented in Table 3. As expected, high-significant relationships were found between the SD4 and SSD4 subscales addressing the Dark Triad traits and their respective equivalents on the DTDD. Nevertheless, the DTDD narcissism subscale showed a low relationship with its counterpart on both SD4 and SSD4. Relationships with social desirability were low to moderate and mostly negative, except for narcissism. Lastly, age relationships were negative, although not statistically significant, with narcissism on both the SD4 and SSD4.

DISCUSSION

The recent proposal of the Dark Tetrad as a model with the potential to provide a better understanding of the nature of the dark personality traits implied the need to develop and adapt new measurement tools to address their assessment. Paulhus et al. (2020) proposed the SD4 to measure machiavellianism, narcissism, psychopathy, and sadism on a single scale. Some new studies on dark traits have already been published based on the original or translated versions of the SD4 (e.g., Tortoriello et al., 2019). Nevertheless, more translations and adaptations of the relatively new SD4 must be carried out to expand the current literature on a cross-cultural level. For this reason, this study aimed to translate and adapt the SD4 to Spanish for a sample of Peruvian adults.

TABLE 3
Relationships between SD4, SSD4, DTDD, social desirability, and age

Scale	Variables	DTDD			Social desirability	Age
		Machiavellianism	Narcissism	Psychopathy		
SD4	Machiavellianism	.52***	.39***	.46***	–.19***	–.20***
	Narcissism	.17***	.21***	.09*	.12**	–.06
	Psychopathy	.53***	.29***	.54***	–.27***	–.10*
	Sadism	.52***	.31***	.56***	–.29***	–.20***
SSD4	Machiavellianism	.50***	.34***	.46***	–.18***	–.18***
	Narcissism	.05	.11**	–.01	.18***	–.04
	Psychopathy	.50***	.26***	.51***	–.28***	–.06
	Sadism	.48***	.29***	.52***	–.25***	–.15***

Note. SD4 = Short Dark Tetrad; SSD4 = Super-Short Dark Tetrad; DTDD = Dark Triad Dirty Dozen Scale.
*$p < .05$; **$p < .01$; ***$p < .001$.

The translation process was meticulously designed on the ITC guidelines for translating and adapting tests (International Test Commission, 2017). The translated version had strong validity evidence based on the test content, obtained through the assessment of different experts in the field and in the objective language. Also, a qualitative set of interviews confirmed that the translated items preserve their intended meaning and are easy to understand for the target population.

Results from the reliability estimates denote higher reliability for the SD4 subscales than the SSD4 version. This scenario is expected due to the impact of test length on reliability estimates, which means that as more items are introduced to the scale, higher reliability estimates will be obtained (Raykov & Marcoulides, 2010). Specifically, a low internal consistency in the SSD4 machiavellianism subscale was found, which may be due to the low factor loadings ($\lambda < .20$) of two items ("Avoid direct conflict with others because they may be useful in the future" and "Keep a low profile if you want to get your way") that emphasize features of their specific factors that are not shared by all four traits (Trahair et al., 2020). Additionally, we tested the reliability of the 12-item Mini SD4 proposed by Neuman et al. (2022) and found low internal consistency indexes, even below .50. Notably, Neuman et al. (2022) found that the 12-item Mini SD4 had an excellent fit to the data, even greater than other models on the complete 28-item scale; nevertheless, the authors did not provide reliability estimates. We strongly suggest avoiding its use as a short version because unreliable results may lead to biased conclusions given that reliability is a condition for validity (American Educational Research Association et al., 2014).

Factorial structure analyses had consistent results with contemporary studies. First, the hierarchical model had a poor fit on both the SD4 and SSD4, which is similar to the result obtained by Meng et al. (2022) in their Chinese version. Regarding the original 4-factor model, fit indices were below the expected thresholds, although not significantly further. Some authors argue that the traditional thresholds proposed by Hu and Bentler (1999) are not suitable for scenarios outside their simulation study (Xia & Yang, 2019), especially when categorical variables are used as inputs (Shi et al., 2019). Thus, we consider that the 4-factor model had a questionable fit for both the SSD4 and SD4. It is important to note that CFA models are restrictive (i.e., by forcing cross-loadings to zero), which can lead to poor fit when constructs tend to overlap. This was previously noted while testing the psychometric properties of the SD4 by Blötner and Beisemann (2022)

and addressed by using modern approaches such as exploratory structural equation modeling (e.g., Blötner et al., 2022).

On the other hand, the bifactor model had the best fit among all proposals; it even showed evidence supporting measurement invariance regarding age and some in favor of gender. These results suggest that the theoretical common core may be empirically modeled. Jones and Figueredo (2013) argued that this common core may be defined as callousness and accounts for the overlap among the Dark Triad; in this sense, our study shows evidence that the same core may be identified for the Dark Tetrad. However, we did not find evidence in favor of unidimensionality for the SD4 nor the SSD4, because the strength of the general factor was not high enough due to low ECV, PUC, and ω_H. A bifactor model may demonstrate a better fit than a restrictive CFA model when factors overlap; nonetheless, theoretical hypotheses conceptualizing the general and group factors are necessary (Bornovalova et al., 2020). In this sense, a better fit was expected due to the overlap between factors previously found in empirical studies (e.g., Blötner & Mokros, 2023); nevertheless, Blötner and Beisemann (2022) pointed out concerns regarding concepts and measures of the dark traits, exposing the lack of theoretical elaboration on the Dark Tetrad and how it reflects on the poor psychometric properties of the SD4 that could not be improved even by modifying items (e.g., Blötner & Grüning, 2023).

In addition, the narcissism subscale had a relatively low relationship with the main core in the bifactor models and had low relationships with the DTDD measures. Further relationship analyses with social desirability show that the narcissism subscale is the only one with a positive low relationship, meaning that a relatively low effect of bias may be found on responses. Possible explanations for its different functioning compared to the other Dark Tetrad traits are based on the fact that narcissism has been found to predict a number of adaptive outcomes, which may explain a more positive link to well-being in contrast to the other traits. For instance, narcissism is associated with lower neuroticism (Papageorgiou et al., 2019) and higher assertiveness (Samuel & Widiger, 2008). Given this, Papageorgiou et al. (2019) posits that the inclusion of subclinical narcissism in the malevolent side of the human personality should be reconsidered. Furthermore, evidence supports that subclinical narcissism is a particularly complex personality trait involving two subtypes: grandiose narcissism, which is characterized by exhibitionism, lack of humility, and interpersonal dominance, while vulnerable narcissism is distinguished by its negative affect, mistrust, and need for attention (Miller et al., 2018). It has been found that people high in grandiose narcissism, in addition to having positive views of themselves, are also flexible in coping with stress, making them psychologically healthier than people in the second subtype. Thus, the grandiose narcissistic trait implies a greater predisposition to adaptive behaviors, while vulnerable narcissism is related to difficulties in a person's functionality. In this topic, Maples et al. (2014) criticized that the SD3 narcissism subscale primarily measures the grandiose aspects of the construct; also, some studies (e.g., Papageorgiou et al., 2018, 2019) found that scores for subclinical narcissism in the SD3 could be biased toward the evaluation of narcissism as a prosocial trait, related to healthy self-esteem, confidence, and autonomy, rather than assessing the antisocial aspects of narcissism.

Conclusion

In conclusion, concerning the comparison between the SD4 and SSD4, the SD4 had higher reliability estimates, although the theoretical measurement models had a better fit for the SSD4. The multidimensional and bifactor models had an adequate fit for both scales; however, we found no evidence in favor of potential unidimensionality in the general factors modeled through the bifactor model. Both scales have evidence for strict measurement invariance regarding age; nevertheless, scalar measurement invariance evidence was found

regarding gender for the SSD4, and only configural invariance evidence was found for the SD4 regarding gender, which is consistent with previous studies (e.g., Blötner et al., 2022). In this sense, unbiased mean comparisons can be performed for the SSD4 by age and gender, and only by age for the SD4. Patterns of relationships were similar in both scales. Thus, the choice between using the SD4 or SSD4 depends on the research objectives. If higher reliability is desired, the SD4 should be the first choice, and if mean comparisons regarding gender are desired, the SSD4 should be employed.

Among the limitations of the current study is the use of an unrandomized sample, which may bias inferential analyses and is the main reason for our focus on effect sizes rather than statistical significance (Wasserstein & Lazar, 2016). Further studies may address the latent modeling from other psychometric perspectives, such as Item Response Theory or Network Analysis. In addition, by dichotomizing a continuous variable such as age for invariance testing, there is a significant loss of information and statistical power; in such cases, local structural equation modeling may be a better approach for future studies (Robitzsch, 2023). Lastly, some studies (e.g., Blötner & Grüning, 2023) tested modifications to the items to improve the measurement with the SD4, we did not consider them, but future studies may benefit from including such changes to improve the scales.

Note

1. Permission to translate was not necessary because the SD4 is freely available for research use. However, we had the author's (D. L. Paulhus) permission to translate and use the scale.

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Appendix

Short Dark Tetrad (SD4)
Original English Version and Spanish Translation

Rate your agreement with each statement using a 5-point scale [Califique qué tan de acuerdo se encuentra con cada afirmación utilizando una escala de 5 puntos]:

Strongly disagree [*Totalmente en desacuerdo*]	*Disagree* [*En desacuerdo*]	*Neutral* [*Ni de acuerdo, ni en desacuerdo*]	*Agree* [*De acuerdo*]	*Strongly agree* [*Totalmente de acuerdo*]
1	2	3	4	5

1. It's not wise to let people know your secrets [Es poco inteligente dejar que las personas conozcan tus secretos]
2. Whatever it takes, you must get the important people on your side [Cueste lo que cueste, debo conseguir que las personas influyentes estén de mi lado]
3. Avoid direct conflict with others because they may be useful in the future [Evito los conflictos directos con los demás porque ellos me pueden ser útiles en el futuro]
4. Keep a low profile if you want to get your way [Para salirme con la mía, debo mantener un perfil bajo]
5. Manipulating the situation takes planning [Para manipular una situación, necesito un plan]
6. Flattery is a good way to get people on your side [Los halagos son una buena forma de poner a las personas de mi lado]
7. I love it when a tricky plan succeeds [Me encanta cuando un plan complejo tiene éxito]

8. People see me as a natural leader [La gente me ve como un líder nato]
9. I have a unique talent for persuading people [Tengo un talento único para persuadir a la gente]
10. Group activities tend to be dull without me [Las actividades sociales sin mí son aburridas]
11. I know that I am special because people keep telling me so [Sé que soy especial porque la gente siempre me lo dice]
12. I have some exceptional qualities [Tengo cualidades excepcionales]
13. I'm likely to become a future star in some area [Me convertiré en una persona famosa en algún área]
14. I like to show off every now and then [Me gusta presumir de vez en cuando]

15. People often say I'm out of control [La gente suele decir que estoy "fuera de control"]
16. I tend to fight against authorities and their rules [Tiendo a enfrentarme a las autoridades y sus reglas]
17. I've been in more fights than most people of my age and gender [He estado en más peleas que la mayoría de las personas de mi edad y sexo]
18. I tend to dive in, then ask questions later [Tiendo a actuar sin pensar en las consecuencias]
19. I've been in trouble with the law [He tenido problemas con la ley]
20. I sometimes get into dangerous situations [Tiendo a involucrarme en situaciones peligrosas]
21. People who mess with me always regret it [Las personas que me hacen enojar siempre se arrepienten]

22. Watching a fist-fight excites me [Me emociona ver una pelea a puñetazos]
23. I really enjoy violent films and video games [Disfruto las películas o videojuegos violentos]
24. It's funny when idiots fall flat on their face [Es gracioso ver a gente caer y quedar en ridículo]
25. I enjoy watching violent sports [Disfruto ver deportes violentos]
26. Some people deserve to suffer [Algunas personas merecen sufrir]
27. Just for kicks, I've said mean things on social media [Solo por diversión, he dicho cosas ofensivas en las redes sociales]
28. I know how to hurt someone with words alone [Sé cómo herir a alguien sólo con palabras]

SD4 (28 ítems): Machiavellianism: 1-7; Narcissism: 8-14; Psychopathy: 15-21; Sadism: 22-28 [SD4 — 28 ítems: Maquiavelismo: 1-7; Narcicismo: 8-14; Psicopatía: 15-21; Sadismo: 22-28]

SSD4 (16 ítems): Machiavellianism: 2, 3, 4, 5; Narcissism: 8, 9, 12, 13; Psychopathy: 15, 16, 17, 18; Sadism: 22, 24, 25, 28 [SSD4 — 16 ítems: Maquiavelismo: 2, 3, 4 y 5; Narcicismo: 8, 9, 12 y 13; Psicopatía: 15, 16, 17 y 18; Sadismo: 22, 24, 25 y 28]

Mini SD4 (12 ítems): Machiavellianism: 1, 3, 5; Narcissism: 8, 10, 13; Psychopathy: 16, 18, 21; Sadism: 22, 23, 26 [Mini SD4 — 12 ítems): Maquiavelismo: 1, 3 y 5; Narcicismo: 8, 10 y 13; Psicopatía: 16, 18 y 21; Sadismo: 22, 23 y 26]