Personality and Individual Differences 247 (2025) 113406

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Investigating the structure of the Short Dark Tetrad: Evidence for a common core, distinct factors, and an oversaturated sadism subscale

Cameron S. Kay [a,b,*], Andrew Castillo [b,c], David M. Condon [b]

[a] Psychology Department, Union College, Schenectady, New York, United States of America
[b] Department of Psychology, University of Oregon, Eugene, Oregon, United States of America
[c] Department of Psychological Sciences, Purdue University, West Lafayette, Indiana, United States of America

ARTICLE INFO

Keywords:
Short Dark Tetrad
Confirmatory factor analysis
Factor structure
Structural equation modelling
Psychometrics

ABSTRACT

The present study evaluates the factor structure of the Short Dark Tetrad (SD4), a measure assessing Machiavellianism, grandiose narcissism, psychopathy, and everyday sadism. Using a large-scale, cross-sectional dataset, we compared nine models, some grounded in theory and others designed to test specific aspects of the scale's structure. Although none of the models fit particularly well, a bifactor model—with a global latent factor and separate specific factors for Machiavellianism/psychopathy, grandiose narcissism, and everyday sadism—provided the best fit. This finding suggests (1) the four SD4 subscales share a common core, (2) the unique aspects of the Machiavellianism and psychopathy subscales represent opposite ends of the same dimension, and (3) the psychopathy and sadism subscales are empirically distinct. However, further investigation into the model also indicated that (4) the sadism subscale is largely defined by vicarious sadism. These findings contribute to our understanding of antagonistic personality traits, while also highlighting the need for further refinement in the measurement of everyday sadism.

1. Introduction

Over a decade ago, Chabrol and colleagues (2009) introduced the concept of the "Dark Tetrad," extending the existing framework of antagonistic personality traits beyond the well-established "Dark Triad." The "Dark Triad", as conceptualized by Paulhus and Williams (2002), included Machiavellianism (characterized by a cynical worldview and a cold, calculating manipulativeness; Christie & Geis, 1970), grandiose narcissism (marked by a sense of entitlement, exhibitionism, and superiority; Raskin & Hall, 1979), and psychopathy (defined by impulsivity and a lack of remorse; Hare, 1980). The "Dark Tetrad" added everyday sadism, a trait that describes the tendency to derive pleasure from everyday acts of cruelty (Buckels et al., 2013). In the present article, we refer to this expanded constellation as the "Antagonistic Tetrad" (see Chester et al., 2025; Kay & Arrow, 2022, 2023).

Researchers have devoted considerable effort to developing new methods of assessing everyday sadism since it was first conceptualized as an antagonistic personality trait. This includes the creation of the 10-item *Short Sadistic Impulses Scale* (O'Meara et al., 2011), the 9-item *Assessment of Sadistic Personality* (Plouffe et al., 2017), and the 18-item *Comprehensive Assessment of Sadistic Tendencies* (Buckels & Paulhus, 2014; see also Paulhus & Jones, 2015). However, few instruments have garnered as much popularity as the 28-item *Short Dark Tetrad* (Paulhus et al., 2021), a successor to the *Short Dark Triad* (SD3; Jones & Paulhus, 2014) that includes everyday sadism as a fourth subscale.

The popularity of the SD4 can be attributed to several factors. First, given the widespread use of the SD3 in prior work, the SD4 provides continuity with how the Antagonistic Triad traits have typically been conceptualized. Second, it is remarkably efficient. Despite only being one item longer than the SD3, the SD4 is able to assess four traits compared to the SD3's three. Finally, according to its creators, the SD4 is better able to distinguish between Machiavellianism and psychopathy. Many existing measures of Machiavellianism, including the SD3, assess something more akin to the reckless abandon of psychopathy than the cold calculating machinations of Machiavellianism (Miller et al., 2017). The SD4 ostensibly addresses this issue.

Early investigations into the SD4's factor structure yielded encouraging results. In the article introducing the SD4 (Paulhus et al., 2021), the authors demonstrated that a four-factor solution provided a fit that was, although not exemplary, comparable to similar measures in the field. They also demonstrated that all of the items from the SD4 loaded 0.30 or higher on their respective factors. Subsequent work from the

* Corresponding author at: Psychology Department, Union College, Alexander Lane, Schenectady, NY 12308, United States of America.
E-mail address: cameronstuartkay@gmail.com (C.S. Kay).

https://doi.org/10.1016/j.paid.2025.113406
Received 16 March 2025; Received in revised form 12 July 2025; Accepted 31 July 2025
Available online 7 August 2025

same team of researchers (Neumann et al., 2021) has found additional support for the four-factor solution, and work from Blötner and colleagues (Blötner & Mokros, 2023; Blötner et al., 2021) has demonstrated that the nomological network of the SD4 mostly aligns with theoretical expectations. The latter group did, however, also find that the SD4's psychopathy subscale evinced a larger association with physical and verbal aggression than the sadism subscale. This presents an issue since people high in psychopathy should, theoretically, disregard the suffering of others, while those high in sadism should, theoretically, derive pleasure from the suffering of others (Paulhus & Dutton, 2016). Nevertheless, the majority of the prior evidence seems to support a four-factor solution.

The prior studies have, however, been limited in terms of the breadth of the alternative models tested. Although it is not practical for a study to test all possible configurations of a measure, it is important to assess a sufficient number of alternative models to determine whether one's chosen model best accounts for the data (Kline, 2016, pp. 456–457). By not testing alternative models, prior studies left two key questions unanswered.

The first question is whether the four SD4 traits share a common core. Numerous studies have suggested that a bifactor model, with a global factor contributing to all of the traits and specific factors contributing to each trait individually, best captures the relations among Antagonistic traits (Gouveia et al., 2016; Jonason et al., 2013; Jonason & Luévano, 2013; Kajonius et al., 2016; Postigo et al., 2024; Watts et al., 2017; see also Moshagen et al., 2018). Particularly relevant to the SD4, prior research has also demonstrated that the SD3 is well represented by a bifactor model (McLarnon & Tarraf, 2017; Persson et al., 2017). Despite this incidental evidence, it is important to empirically test whether the four factors of the SD4 share a common core, as doing so will help clarify whether the traits reflect a broader underlying disposition.

The second unaddressed question is whether the four SD4 traits are sufficiently distinct to serve as separable factors. As noted above, measures of Machiavellianism have, historically, measured something more akin to psychopathy than Machiavellianism (see Kay & Arrow, 2022; but see also Collison et al., 2018, for an exception). Moreover, prior research on the structure of the SD3 showed that a model with a combined latent factor for Machiavellianism/psychopathy provided the best fit (Persson et al., 2017). The Machiavellianism and psychopathy items from the SD4 may, therefore, also be best represented by a single latent factor. Given that the association between the scale's psychopathy and sadism subscales tends to be greater than the association between its Machiavellianism and psychopathy subscales (Paulhus et al., 2021), it is also plausible that the psychopathy and sadism items would form a single latent factor.

The objective of the present study is to systematically test the two previously outlined questions by providing a high-powered and comprehensive comparison of nine separate factor solutions to the SD4 (Fig. 1). To address the first question, we will fit a set of bifactor models to examine whether a single core can be extracted from the traits. To address the second question, we will consider a range of models with different specific factors. This includes models with separate specific factors for each of the Antagonistic Tetrad traits; combined specific factors for Machiavellianism and psychopathy; combined specific factors for psychopathy and sadism; and combined specific factors for Machiavellianism, psychopathy, and sadism. Guided by previous research (and as preregistered: https://osf.io/m4ebd/?view_only=c1db5dc3f6cb4ce59ffcfa18d736c831), we anticipate the best-fitting model will be Model B_{BI}. This model includes a global factor, a combined specific factor for Machiavellianism, psychopathy, and sadism, and a specific factor for narcissism.

Given the prior work showing that the psychopathy subscale from the SD4 evinces larger associations than the sadism subscale with physical and verbal aggression (Blötner & Mokros, 2023; Blötner et al., 2021), we will also examine the relation of the sadism subscale with the physical sadism, verbal sadism, and vicarious sadism subscales from the *Comprehensive Assessment of Sadistic Tendencies* (CAST; Buckels & Paulhus, 2014; see also Paulhus & Jones, 2015). We will do this to provide a better understanding of the specific aspects of everyday sadism captured by the sadism subscale of the SD4. We have no hypotheses on this end and, therefore, provide the analysis as an exploratory investigation.

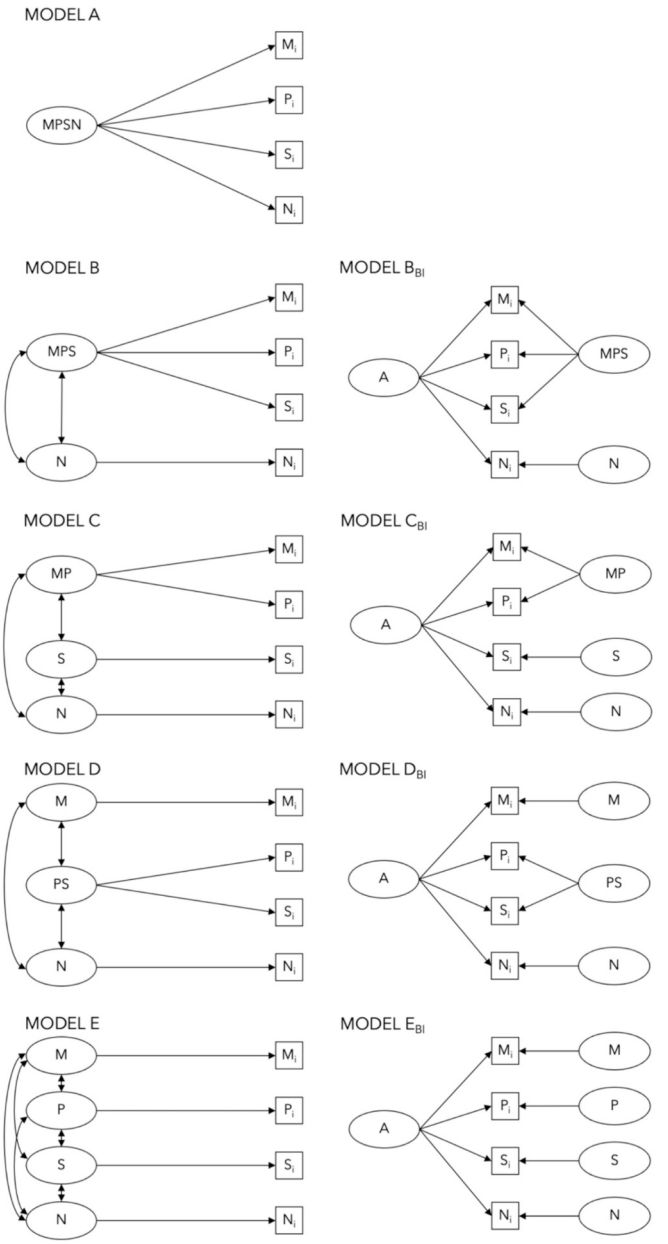

Fig. 1. The nine models tested in the present study.
Note. BI = bifactor; M = Machiavellianism; N = grandiose narcissism; P = psychopathy; S = sadism; A = antagonism. For legibility, only one item is shown for each subscale of the SD4.

2. Method

2.1. Participants and procedures

The present study made use of the *Synthetic Aperture Personality Assessment* (SAPA) procedure (see Revelle et al., 2016). This procedure involves administering a random subset of all relevant items to participants. Analyses are then conducted on covariance matrices calculated

using every pairwise administration of the items. For the matrices to be stable, the effective *N*—the average number of pairwise comparisons—needs to be sufficiently large (see Condon et al., 2015).

The effective *N* for the present study was more than sufficient. Data from 64,567 participants (68 % female; $Med_{AGE} = 23.00$; $M_{AGE} = 25.80$; $SD_{AGE} = 9.08$) were collected through SAPA (www.sapa-project.org) between July 2020 and February 2021. Privacy rights were observed and informed consent was obtained for all of the participants. In exchange for their participation, the participants were provided customized feedback about their personalities based on the *SAPA Personality Inventory* (Condon, 2018). On average, each item was completed by 1295 participants (*Med* = 1297.00; *M* = 1295.88; *SD* = 33.85), translating to 95 % power when testing that correlations of ±0.10 are statistically different from 0 and 80 % power when testing that correlations of ±0.08 are statistically different from 0.

2.2. Measures

The SD4 (Paulhus et al., 2021) is a 28-item scale designed to assess four traits: Machiavellianism (e.g., "It's not wise to let people know your secrets"; α = 0.56, $\bar{r}_{ij} = 0.15$), grandiose narcissism (e.g., "People see me as a natural leader"; α = 0.71, $\bar{r}_{ij} = 0.26$), psychopathy (e.g., "People often say I'm out of control"; α = 0.66, $\bar{r}_{ij} = 0.22$), and everyday sadism (e.g., "Watching a fist-fight excites me"; α = 0.72, $\bar{r}_{ij} = 0.26$). Participants responded to the SD4 using a six-point scale ranging from 1 ("very inaccurate") to 6 ("very accurate"). Each participant included in the present study responded to at least two items from the SD4 (*M* = 3.97, *SD* = 1.84).[1]

The CAST (Buckels & Paulhus, 2014; see also Paulhus & Jones, 2015) is an 18-item measure of physical (e.g., "I enjoy physically hurting people"; α = 0.69, $\bar{r}_{ij} = 0.33$), verbal (e.g., "I enjoy making jokes at the expense of others"; α = 0.74, $\bar{r}_{ij} = 0.32$), and vicarious (e.g., "I love to watch YouTube clips of people fighting"; α = 0.72, $\bar{r}_{ij} = 0.27$) sadism. Participants responded to the CAST using a six-point scale ranging from 1 ("very inaccurate") to 6 ("very accurate").

3. Analytic strategy and results

3.1. Confirmatory analyses

We used the *lavaan* package (Version 0.6-19; Rosseel, 2012) in *R* (Version 4.5.0; R Core Team, 2021) to specify and fit the nine confirmatory factor analysis (CFA) models (Table 1).[2] Departing from the preregistration, we used maximum likelihood (ML) as the estimator for our models instead of weighted least squares with mean- and variance-adjusted fit statistics (WLSMV). We made this change because analyzing data collected using the SAPA procedure requires the use of covariance matrices, which presupposes the use of an ML estimator.[3] The use of an ML estimator should not meaningfully affect our results. The data were not severely non-normal (skews [g_1] = −1.18 to 1.61; kurtoses [$g_2 - 3$] = −1.29 to 1.46; see Kline, 2016), and, in cases where there are six or more response options (as is the case here), ML tends to produce comparable results to categorical least squares (Rhemtulla et al., 2012).

To assess model fit, we calculated six indices for each model: (1) chi-square (χ^2), (2) the comparative fit index (CFI), (3) the standardized root mean square residual (SRMR), (4) the root mean square error of approximation (RMSEA) with 90 % confidence intervals, (5) Akaike's information criterion (AIC), and (6) the Bayesian information criterion (BIC). We considered the best-fitting model to be the model with the largest CFI and the smallest χ^2, RMSEA, and SRMR. The one deviation from our preregistration here was that we calculated χ^2 instead of the Satorra-Bentler χ^2 because the Satorra-Bentler χ^2 is not available when using lavaan's ML estimator. We did not use AIC and BIC for model selection but instead used them to evaluate the models' fit when accounting for parsimony (Kass & Raftery, 1995).

Of the nine models tested, Model C_{BI}—the bifactor model with a combined Machiavellianism and psychopathy specific factor—emerged as the best-fitting model ($\chi^2(322, N = 1295) = 1606.92$, $p < .001$, CFI = 0.805, SRMR = 0.050, RMSEA = 0.055, 90 % CI = [0.053, 0.058]), even when taking into account model parsimony (AIC = 130,983.41, BIC = 131,417.51). All items loaded significantly on the global factor in this model. Most items also showed significant loadings on their respective specific factors, although with a few exceptions. Notably, the Machiavellianism item "I love it when a tricky plan succeeds" did not load significantly on the combined Machiavellianism/psychopathy specific factor (λ = 0.05, 95 % CI = [−0.02, 0.12], $p = .138$) nor did the psychopathy item "People who mess with me always regret it" (λ = 0.01, 95 % CI = [−0.06, 0.07], $p = .880$). Likewise, the item "I know how to hurt someone with words alone" did not load significantly on the sadism specific factor (λ = −0.06, 95 % CI = [−0.12, 0.00], $p = .061$). It is also worth noting that the sadism-specific factor was primarily defined by vicarious sadism, with the only loadings greater than 0.20 being "Watching a fist-fight excites me" (λ = 0.57, 95 % CI = [0.52, 0.62], $p < .001$), "I really enjoy violent films and video games" (λ = 0.57, 95 % CI = [0.52, 0.62], $p < .001$), and "I enjoy violent sports" (λ = 0.79, 95 % CI = [0.74, 0.84], $p < .001$). The Machiavellianism and psychopathy items also generally loaded in opposite directions on their combined specific factor.

Of the five non-bifactor models, Model E—the model with separate specific factors for each trait—was the best fitting model ($\chi^2(344, N = 1295) = 2284.32$, $p < .001$, CFI = 0.705, SRMR = 0.068, RMSEA = 0.066, 90 % CI = [0.063, 0.069]), even when taking into account model parsimony (AIC = 131,616.81, BIC = 131,937.22). All items loaded significantly on their respective factors in this model. Similar to Model C_{BI}, the sadism factor in Model E was mostly defined by items indicative of vicarious sadism (λs = 0.65–0.73).

3.2. Exploratory analyses

To identify the specific aspects of everyday sadism captured by the sadism subscale of the SD4, we fit three CFA models. Each model included the items from the sadism subscale loading on a single latent factor and the items from one of the three CAST subscales loading on a single latent factor. In each model, the two latent factors were allowed to covary, with the standardized covariance (i.e., factor correlation) providing an index of the association between the sadism subscale and the specific form of sadism captured by the CAST subscale in the model.[4]

The sadism subscale of the SD4 was highly associated with the three forms of sadism assessed by the CAST. Specifically, it showed a large positive correlation with physical sadism (φ = 0.68, 95 % CI = [0.63, 0.72], $p < .001$), verbal sadism (φ = 0.67, 95 % CI = [0.63, 0.72], $p < .001$), and vicarious sadism (φ = 1.00, 95 % CI = [1.00, 1.00], $p < .001$). In fact, the subscale was almost entirely redundant with vicarious

[1] The descriptive statistics, correlation matrix, and covariance matrix for the SD4 items can be found in the Supplementary Material.

[2] The loadings for the nine models can be found in the Supplementary Material, as can the correlations among the latent factors in the non-bifactor models.

[3] Model results using a WLSMV estimator with imputed data can be found in the Supplementary Material, as can model results using an ML estimator with robust standard errors (MLM). The conclusions that can be drawn from these results are the same as can be drawn from the results presented here, save for Model B_{BI} not converging when using the MLM estimator.

[4] Fit statistics for the models testing the association of the sadism subscale with the three CAST subscales can be found in the Supplementary Material, as can fit statistics and standardized covariances substituting the items from the sadism subscale with the items from the Machiavellianism, narcissism, and psychopathy subscales.

Table 1
Fit statistics for the nine models.

Model	χ^2	*df*	*p*	CFI	SRMR	RMSEA [90 % CI]	AIC	BIC
Model A	3809.24	350	<.001	0.475	0.084	0.087 [0.085, 0.090]	133,129.73	133,419.13
Model B	2894.75	349	<.001	0.614	0.073	0.075 [0.072, 0.078]	132,217.24	132,511.81
Model C	2547.34	347	<.001	0.666	0.071	0.070 [0.067, 0.072]	131,873.84	132,178.74
Model D	2641.31	347	<.001	0.652	0.070	0.071 [0.069, 0.074]	131,967.80	132,272.70
Model E	2284.32	344	<.001	0.705	0.068	0.066 [0.063, 0.069]	131,616.81	131,937.22
Model B_{BI}	2050.83	322	<.001	0.738	0.058	0.064 [0.062, 0.067]	131,427.32	131,861.41
Model C_{BI}	1606.92	322	<.001	0.805	0.050	0.055 [0.053, 0.058]	130,983.41	131,417.51
Model D_{BI}	1779.86	322	<.001	0.779	0.055	0.059 [0.056, 0.062]	131,156.35	131,590.45
Model E_{BI}	1638.23	322	<.001	0.800	0.052	0.056 [0.053, 0.059]	131,014.73	131,448.82

Note. BI = bifactor.

sadism, producing a negative variance for the vicarious sadism latent factor (i.e., a Heywood case) unless the correlation was constrained to be less than or equal to 1.00.

To further investigate whether the associations observed for the sadism subscale were significantly different from those observed for the psychopathy subscale, we fit the same three models described above but replaced the items from the sadism subscale with the items from the psychopathy subscale. We then assessed model fit under two conditions: when the correlations were freely estimated and when they were constrained to be equal to those observed in the sadism models. By comparing model fit across these two conditions, we were able to test whether the correlations observed for the psychopathy subscale significantly differed from those observed for the sadism subscale.

The psychopathy subscale only showed a significantly smaller association than the sadism subscale with vicarious sadism ($\varphi = 0.56$, 95 % CI = [0.50, 0.62], $p < .001$; $\Delta\chi^2(1) = 391.46$, $p < .001$). Its associations with physical sadism ($\varphi = 0.65$, 95 % CI = [0.60, 0.71], $p < .001$; $\Delta\chi^2(1) = 0.812$, $p = .368$) and verbal sadism ($\varphi = 0.61$, 95 % CI = [0.56, 0.67], $p < .001$; $\Delta\chi^2(1) = 3.828$, $p = .050$) were comparable to those observed for the sadism subscale.

Given the possibility that the outsized association of the sadism subscale with vicarious sadism (and the undersized associations of the sadism subscale with physical and verbal sadism) was due to oversaturation of the sadism subscale with items related to vicarious sadism, we further examined how dropping each of the three vicarious sadism items from the subscale affected its unidimensionality (see Revelle & Condon, 2025). We then reanalyzed the results using a truncated version of the subscale based on the results of this analysis.

Before dropping any of the items, the unidimensionality of the subscale was 0.76. Dropping the fist-fight ($u = 0.75$) and violent films ($u = 0.76$) items did not have much impact on the subscale's undimensionality. Dropping the violent sports item did ($u = 0.88$).[5] After removing the violent sports item, all of the sadism items loaded above 0.40 on the sadism latent factor in Model E ($\lambda s = 0.41$–0.58), and the sadism subscale evinced larger associations than the psychopathy subscale with physical ($\Delta\chi^2(1) = 30.30$, $p < .001$), verbal ($\Delta\chi^2(1) = 84.96$, $p < .001$), and vicarious ($\Delta\chi^2(1) = 391.46$, $p < .001$) sadism.[6]

4. Discussion

The purpose of the present study was to answer two questions about the structure of the SD4 (Paulhus et al., 2021). The first question was whether a common core underlies the measure. The second question was whether Machiavellianism, grandiose narcissism, psychopathy, and everyday sadism are sufficiently distinct to form four separable factors. To answer these questions, we used a large multi-national sample to compare nine candidate models. We expected Model B_{BI}, which had a global latent factor, a combined specific factor for Machiavellianism, psychopathy, and sadism, and a specific factor for narcissism, would provide the best fit to the data.

With respect to the first question, the results indicated that there does appear to be a common core underlying the SD4 subscales. All of the items from the SD4 loaded to a significant degree on the global factor in the bifactor models. Moreover, all of the bifactor models fit the data better than their non-bifactor counterparts, although we recommend some caution in interpreting this latter finding. Due to their flexibility, bifactor models generally provide a better fit than non-bifactor models, even when a bifactor model is not the best representation of the data (see Bonifay & Cai, 2017). Furthermore, despite performing better than their non-bifactor counterparts, the present bifactor models still demonstrated poor fit in absolute terms (Hu & Bentler, 1999; MacCallum et al., 1996). Bifactor models can, however, be valuable for testing for the presence of a common source of variance in one's data (see Bornovalova et al., 2020) and, in the present study, the significant loadings on the global factor indicate that there does appear to be a common core underlying the SD4's subscales. This echoes previous work showing antagonistic traits are united by a common core (Gouveia et al., 2016; Jonason et al., 2013; Jonason & Luévano, 2013; Kajonius et al., 2016; McLarnon & Tarraf, 2017; Moshagen et al., 2018; Persson et al., 2017; Postigo et al., 2024; Watts et al., 2017).

Concerning the second question, the results indicate that Machiavellianism, grandiose narcissism, psychopathy, and everyday sadism are separable in the SD4. While we anticipated that the Machiavellianism, psychopathy, and sadism items would share a specific factor, the actual best-fitting model (Model C_{BI}) separated sadism into its own factor. The Machiavellianism and psychopathy items did mostly load on the same factor in this model, but generally in opposite directions, which is consistent with the theoretical understanding of these constructs (see Miller et al., 2017) and an improvement over the SD3 (Persson et al., 2017). Moreover, of the non-bifactor models, the best-fitting model (Model E) had four separate factors.

It is, nevertheless, worth noting that we also identified a potential issue with the sadism subscale of the SD4. Namely, the subscale appears to primarily capture vicarious sadism. In Model C_{BI}, the three vicarious sadism items loaded above 0.57 on the sadism latent factor, while the remaining seven items had loadings of 0.16 or less, and, in Model E, the three vicarious sadism items loaded above 0.65 on the sadism latent factor, while the remaining seven items had loadings of 0.45 or less. Moreover, the sadism subscale only showed a larger association than the psychopathy subscale with vicarious sadism; it was no more associated than the psychopathy subscale with physical and verbal sadism. These findings could explain why Blötner and colleagues (Blötner & Mokros, 2023; Blötner et al., 2021) found that the psychopathy subscale was more highly associated with physical and verbal aggression than the sadism subscale. That being said, we found that dropping the violent

[5] A full set of unidimensionality estimates, showing how the coherence of the sadism subscale varies as a function of the inclusion/exclusion of the vicarious sadism items, can be found in the Supplementary Material.

[6] Model results for the nine CFA models after the violent sports item is excluded can be found in the Supplementary Material, as can updated loadings for Model C_{BI} and Model E and updated fit statistics and standardized covariances for the models testing the associations between the four SD4 subscales and the three CAST subscales.

sports item from the sadism subscale can go a long way in addressing this issue.

5. Limitations and future directions

While it contributes valuable insight into the factor structure of the SD4, the present study is subject to several limitations. First, participants responded to the SD4 using the six-point accuracy response scale used by the SAPA rather than the five-point Likert scale typically used with the measure. This could have influenced the results observed here. Second, most of the participants in the present sample were living in Western Educated Industrialized Rich and Democratic societies (Henrich et al., 2010) and all had access to the internet and were interested in learning about their personalities via an online survey. Given the structure of personality varies across cultures (e.g., De Raad et al., 2010), it is plausible that the present findings would not generalize to other cultures and contexts. We, therefore, recommend further work be undertaken to explore the structure of the SD4 across cultures and contexts. Finally, by using CFA instead of Exploratory Factor Analysis (EFA), we did not test configurations outside of our nine predefined models. This was intentional. Since we specifically wanted to test hypotheses about a circumscribed set of models, CFA was the appropriate choice. Nevertheless, the results of two EFA models conducted using the present data can be found in the Supplementary Material.

6. Conclusion

Our study contributes to a growing body of research that demonstrates the utility of the SD4 over the SD3. However, it also points to at least one area where the SD4 could be further refined. A critical observation from our study is that the everyday sadism subscale of the SD4 appears to primarily assess *vicarious* sadism. We, therefore, recommend further fine-tuning of the SD4 to bring the sadism subscale into alignment with its theoretical counterpart.

CRediT authorship contribution statement

Cameron S. Kay: Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Andrew Castillo:** Writing – review & editing. **David M. Condon:** Writing – review & editing, Supervision, Methodology, Investigation, Data curation, Conceptualization.

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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2025.113406.

Data availability

The preregistration for the present study is provided at https://osf.io/m4ebd/?view_only=c1db5dc3f6cb4ce59ffcfa18d736c831. The items from the SD4 and CAST can be found at https://www2.psych.ubc.ca/~dpaulhus/research/DARK_TRAITS/. The analytic code and full covariance matrix, which can be used to reproduce the results observed in the present study, can be found at https://osf.io/qmcvw/?view_only=bdd0bb30f21d4d81b40357cde49e5256.

References

Blötner, C., & Mokros, A. (2023). The next distinction without a difference: Do psychopathy and sadism scales assess the same construct? *Personality and Individual Differences, 205*. https://doi.org/10.1016/j.paid.2023.112102

Blötner, C., Ziegler, M., Wehner, C., Back, M. D., & Grosz, M. P. (2021). The nomological network of the Short Dark Tetrad Scale (SD4). *European Journal of Psychological Assessment*. https://doi.org/10.1027/1015-5759/a000655

Bonifay, W., & Cai, L. (2017). On the complexity of item response theory models. *Multivariate Behavioral Research, 52*(4), 465–484. https://doi.org/10.1080/00273171.2017.1309262

Bornovalova, M. A., Choate, A. M., Fatimah, H., Petersen, K. J., & Wiernik, B. M. (2020). Appropriate use of bifactor analysis in psychopathology research: Appreciating benefits and limitations. *Biological Psychiatry, 88*(1), 18–27. https://doi.org/10.1016/j.biopsych.2020.01.013

Buckels, E. E., Jones, D. N., & Paulhus, D. L. (2013). Behavioral confirmation of everyday sadism. *Psychological Science, 24*(11), 2201–2209. https://doi.org/10.1177/0956797613490749

Buckels, E. E., & Paulhus, D. L. (2014). *Comprehensive Assessment of Sadistic Tendencies (CAST)*. Vancouver, Canada: University of British Columbia (Unpublished instrument).

Chabrol, H., Van Leeuwen, N., Rodgers, R., & Séjourné, N. (2009). Contributions of psychopathic, narcissistic, Machiavellian, and sadistic personality traits to juvenile delinquency. *Personality and Individual Differences, 47*(7), 734–739. https://doi.org/10.1016/j.paid.2009.06.020

Chester, D. S., Lynam, D. R., & Miller, J. D. (2025). It is past time to abandon the term "dark" as a descriptor of antagonistic traits. *Journal of Psychopathology and Clinical Science*. https://doi.org/10.1037/abn0001024

Christie, R., & Geis, F. L. (1970). *Studies in Machiavellianism*. Academic Press, Inc.

Collison, K. L., Vize, C. E., Miller, J. D., & Lynam, D. R. (2018). Development and preliminary validation of a five factor model measure of Machiavellianism. *Psychological Assessment, 30*(10), 1401–1407. https://doi.org/10.1037/pas0000637

Condon, D. M. (2018). *The SAPA Personality Inventory: An empirically-derived, hierarchically-organized self-report personality assessment model*. https://doi.org/10.31234/osf.io/sc4p9

Condon, D. M., Wilt, J., Cohen, C. A., Revelle, W., Hegarty, M., & Uttal, D. H. (2015). Sense of direction: General factor saturation and associations with the Big-Five traits. *Personality and Individual Differences, 86*, 38–43. https://doi.org/10.1016/j.paid.2015.05.023

De Raad, B., Barelds, D. P. H., Levert, E., Ostendorf, F., Mlačić, B., Di Blas, L., Hřebíčková, M., Szirmák, Z., Szarota, P., Perugini, M., Church, A. T., & Katigbak, M. S. (2010). Only three factors of personality description are fully replicable across languages: A comparison of 14 trait taxonomies. *Journal of Personality and Social Psychology, 98*(1), 160–173. https://doi.org/10.1037/a0017184

Gouveia, V. V., Monteiro, R. P., Gouveia, R. S. V., Athayde, R. A. A., & Cavalcanti, T. M. (2016). Avaliando o lado sombrio da personalidade: Evidências psicométricas do dark triad dirty dozen. *Interamerican Journal of Psychology, 50*(3), 420–432.

Hare, R. D. (1980). A research scale for the assessment of psychopathy in criminal populations. *Personality and Individual Differences, 1*(2), 111–119. https://doi.org/10.1016/0191-8869(80)90028-8

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences, 33*(2–3), 61–83. https://doi.org/10.1017/S0140525X0999152X

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Jonason, P. K., Kaufman, S. B., Webster, G. D., & Geher, G. (2013). What lies beneath the Dark Triad Dirty Dozen: Varied relations with the Big Five. *Individual Differences Research, 11*(2), 81–90.

Jonason, P. K., & Luévano, V. X. (2013). Walking the thin line between efficiency and accuracy: Validity and structural properties of the Dirty Dozen. *Personality and Individual Differences, 55*(1), 76–81. https://doi.org/10.1016/j.paid.2013.02.010

Jones, D. N., & Paulhus, D. L. (2014). Introducing the Short Dark Triad (SD3). *Assessment, 21*(1), 28–41. https://doi.org/10.1177/1073191113514105

Kajonius, P. J., Persson, B. N., Rosenberg, P., & Garcia, D. (2016). The (mis)measurement of the Dark Triad Dirty Dozen: Exploitation at the core of the scale. *PeerJ, 2016*(3), 1–21. https://doi.org/10.7717/peerj.1748

Kass, R. E., & Raftery, A. E. (1995). Bayes factors. *Journal of the American Statistical Association, 90*(430), 773–795. https://doi.org/10.1080/01621459.1995.10476572

Kay, C. S., & Arrow, H. (2022). Taking an elemental approach to the conceptualization and measurement of Machiavellianism, narcissism, and psychopathy. *Social and Personality Psychology Compass, 16*(4), Article e12662. https://doi.org/10.1111/spc3.12662

Kay, C. S., & Arrow, H. (2023). Eight misconceptions about the elemental approach and aversive personality trait research: A response to Andrews and colleagues (2023). *Social and Personality Psychology Compass*, 1–5. https://doi.org/10.1111/spc3.12769

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). The Guilford Press.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods, 1*(2), 130–149. https://doi.org/10.1037/1082-989X.1.2.130

McLarnon, M. J. W., & Tarraf, R. C. (2017). The Dark Triad: Specific or general sources of variance? A bifactor exploratory structural equation modeling approach. *Personality and Individual Differences, 112*, 67–73. https://doi.org/10.1016/j.paid.2017.02.049

Miller, J. D., Hyatt, C. S., Maples-Keller, J. L., Carter, N. T., & Lynam, D. R. (2017). Psychopathy and Machiavellianism: A distinction without a difference? *Journal of Personality, 85*(4), 439–453. https://doi.org/10.1111/jopy.12251

Moshagen, M., Hilbig, B. E., & Zettler, I. (2018). The dark core of personality. *Psychological Review, 125*(5), 656–688. https://doi.org/10.1037/rev0000111

Neumann, C. S., Jones, D. N., & Paulhus, D. L. (2021). Examining the Short Dark Tetrad (SD4) across models, correlates, and gender. *Assessment*. https://doi.org/10.1177/107319112098662

O'Meara, A., Davies, J., & Hammond, S. (2011). The psychometric properties and utility of the Short Sadistic Impulse Scale (SSIS). *Psychological Assessment, 23*(2), 523–531. https://doi.org/10.1037/a0022400

Paulhus, D. L., Buckels, E. E., Trapnell, P. D., & Jones, D. N. (2021). Screening for dark personalities: The Short Dark Tetrad (SD4). *European Journal of Psychological Assessment, 37*(3), 208–222. https://doi.org/10.1027/1015-5759/a000602

Paulhus, D. L., & Dutton, D. G. (2016). Everyday sadism. In V. Zeigler-Hill, & D. K. Marcus (Eds.), *The dark side of personality: Science and practice in social, personality, and clinical psychology* (1st ed., pp. 109–120). American Psychological Association. https://doi.org/10.1037/14854-006.

Paulhus, D. L., & Jones, D. N. (2015). *Measures of dark personalities* (pp. 562–594). https://doi.org/10.1016/B978-0-12-386915-9.00020-6

Paulhus, D. L., & Williams, K. M. (2002). The Dark Triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality, 36*(6), 556–563. https://doi.org/10.1016/S0092-6566(02)00505-6

Persson, B. N., Kajonius, P. J., & Garcia, D. (2017). Revisiting the structure of the Short Dark Triad. *Assessment*. https://doi.org/10.1177/1073191117701192

Plouffe, R. A., Saklofske, D. H., & Smith, M. M. (2017). The assessment of sadistic personality: Preliminary psychometric evidence for a new measure. *Personality and Individual Differences, 104*, 166–171. https://doi.org/10.1016/j.paid.2016.07.043

Postigo, Á., García-Fernández, J., Cuesta, M., Recio, P., Barría-González, J., & Lozano, L. M. (2024). Giving meaning to the Dark Triad: Comparison of different factor structures of the Dirty Dozen through eight regions of the world. *Assessment, 31*(6), 1218–1232. https://doi.org/10.1177/10731911231209282

R Core Team. (2021). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.R-project.org/.

Raskin, R. N., & Hall, C. S. (1979). A narcissistic personality inventory. *Psychological Reports, 45*, 590. https://doi.org/10.2466/pr0.1979.45.2.590

Revelle, W., & Condon, D. M. (2025). unidim: An index of scale homogeneity and unidimensionality. *Psychological Methods*. https://doi.org/10.1037/met0000729

Revelle, W., Condon, D. M., Wilt, J., French, J. A., Brown, A., & Elleman, L. G. (2016). Web and phone based data collection using planned missing designs. In N. Fielding, R. M. Lee, & G. Blank (Eds.), *SAGE handbook of online research methods* (2nd ed., pp. 578–595). London: Sage.

Rhemtulla, M., Brosseau-Liard, P.É., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods, 17*(3), 354–373. https://doi.org/10.1037/a0029315

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02. Retrieved from https://www.jstatsoft.org/v48/i02/.

Watts, A. L., Waldman, I. D., Smith, S. F., Poore, H. E., & Lilienfeld, S. O. (2017). The nature and correlates of the Dark Triad: The answers depend on the questions. *Journal of Abnormal Psychology, 126*, 951–968. https://doi.org/10.1037/abn0000296