The Dark Side of Humanity Scale: A reconstruction of the Dark Tetrad constructs

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ABSTRACT

There has been an absence of consideration regarding measurement invariance across males and females in the widely available Dark Tetrad (DT) scales which measure psychopathy, Machiavellianism, narcissism and everyday sadism. This has resulted in criticisms of the measures, suggesting that the assessed constructs are not wholly relatable between the groups. This article documents the construction and validation of the Dark Side of Humanity Scale (DSHS), which measures dark personalities from an alternative viewpoint, determined by the constructs as they emerged from the male and female data, whilst aligning with theory and attaining invariance between sex. Across four samples ($n = 2409$), using a diverse range of statistical methods, including exploratory graph analysis, item response theory and confirmatory factor analysis, a divergence from the widely available DT measures emerged, whereby primary psychopathy and Machiavellianism were unified. This corroborated past research which had discussed the two constructs as being parallel. It further supported the DSHS with a shift away from the traditional DT conceptualisation. The resulting scale encompasses four factors which are sex invariant across samples and time. The first factor represents the successful psychopath, factor two addresses the grandiose form of entitlement, factor three taps into everyday sadism whilst the fourth factor pertains to narcissistic entitlement rage. Construct and external validity of the DSHS across two samples ($n = 1338$), as well as test-retest reliability ($n = 413$), was achieved. The DSHS provides an alternative approach to investigating the dark side of human nature, whilst also being sex invariant, thus making it highly suitable for use with mixed sex samples.

1. Introduction

Given the increase in the study of dark personality traits over the past decade, numerous widely available scales have been developed to measure psychopathy, narcissism, Machiavellianism and everyday sadism (e.g., Dirty Dozen (Jonason & Webster, 2010); Assessment of Sadistic Personality (Plouffe et al., 2017)), which may raise the question as to why a new scale is needed or is indeed necessary. In response and in agreement with Neumann et al. (2021), we contend that there has been an absence of consideration regarding measurement invariance across sex (we use the term sex, to refer to biological differences between males and females (APA, 2021)). Research has predominantly shown that females score lower on the Dark Tetrad traits comparatively to males (Paulhus et al., 2021). One interpretation indicates this demonstrates a true intersex difference, whereby females manifest dark traits to a lesser extent (Levenson et al., 1995; Wright et al., 2010). This paper, however,

adopts a different perspective, where we consider that the issue may be attributed to the fundamental requirement of sex equivalence generally being considered following item development, often resulting in scalar invariance not being satisfied (Forouzan & Cooke, 2005; Neumann et al., 2021). This has led to criticisms of the measures, suggesting that constructs are not wholly relatable across males and females (Anestis et al., 2011; Eichenbaum et al., 2019).

The focus on sex rather than gender captures the biological or material aspects of identity, conversely to gender, which is a construct that focuses on the psychological dimensions of identity. The gender we adopt therefore becomes a choice, which far extends beyond the male/female binary (we have people identifying as non-binary, gender queer, fluid, trans etc.) and does not have to be tied to our biological sex (Gherovici, 2010). Gender is therefore a site for identity politics and the complexities of this construct are beyond the scope of the current paper but do warrant further investigation. Nonetheless, we have focused on

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biological sex to examine the binary between males and females, aligning with dark personality literature which has been grounded within an evolutionary perspective (Jonason & Webster, 2010). This posits that a fast life history strategy embodied by males, or a slow life history attributed to females, may be aroused by biologically evolved sex differences, inducing sex-specific traits within dark personality constructs (see Jonason et al., 2010; Jonason et al., 2012; Jonason & Lavertu, 2017).

The Dark Tetrad encompasses broad constructs which embody a plethora of personality traits (Rogoza & Cieciuch, 2018). Machiavellianism describes characteristics of misanthropy and manipulation, whereby power, strategic planning and deceit are inextricably entwined (Christie & Geis, 1970). Grandiose narcissism is typified by entitled exploitation, inflated self-esteem and a disproportionate need for power (Krizan & Herlache, 2018; Green et al., 2020), whilst vulnerable narcissism, addresses hypersensitivity, low self-esteem, entitled resentment and rage (Kealy et al., 2020). Primary psychopathy is associated with callousness, deceit, manipulation and a lack of remorse (Cleckley, 1941), whilst the secondary facet is epitomised by impulsivity intermeshed with antisocial behaviour (Jones & Paulhus, 2014). Everyday sadism relates to individuals who have dispositional tendencies to fantasise about, watch or directly inflict psychological and/or physical pain and humiliation on others, whilst taking pleasure from their suffering (Kowalski et al., 2019; Lui et al., 2020). The importance of investigating the relationships between dark personality traits with behaviours which violate societal norms, for example, political radicalisation, cyberstalking, psychological and sexual abuse (Chabrol et al., 2020; Miller, Bouffard, & DeHaan, 2017; Smoker & March, 2017; Valashjardi et al., 2020), is indisputable. However, for findings to be meaningful, it is crucial to show that dark traits reflect the same thing for males and females, which can only be evidenced through measures which are scalar invariant, enabling mean scores to be comparable (Neumann et al., 2021).

Yet, despite a wide range of extensively and actively used Dark Tetrad measures, few have been investigated for invariance. Firstly, considering psychopathy, only the Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995), supported scalar invariance (Lynam et al., 1999; Salekin et al., 2014). The lack of full scalar invariance in measures such as the Self-Report Psychopathy Scale III (SRP-III; Williams, Nathanson, and Paulhus, 2003) and the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld et al., 2005), was attributed to the differing male and female manifestations and/or the semantics of the indicators evoking inadvertent sex-specific responses (Dotterer et al., 2017; Eichenbaum et al., 2019; Gummelt et al., 2012). Specifically for the PPI-R, the evidence suggested that when a mixed sex sample was used, neither one, two or three factor structures provided an adequate fit, intimating that applying any of these models to a mixed sex sample was unsuitable (Anestis et al., 2011). This is unsurprising as 80 out of the 130 scale items function differently across sex (Eichenbaum et al., 2019). Accordingly, the same score on psychopathy measures may capture different facets of the construct, with divergent meanings for males and females (Marion & Sellbom, 2011). This qualitative difference has been found in studies where males endorsed items tapping into boredom, impulsivity and a lack of long-term goals, whilst females endorsed indicators which addressed manipulation and egocentricity (Gummelt et al., 2012).

The sex variance of the Narcissistic Personality Inventory (NPI: Raskin & Hall, 1979), has mainly been attributed to gender role socialisation, whereby narcissistic characteristics align with masculine stereotypes in Western cultures (Corry et al., 2008; Wilson & Sibley, 2011). However, conflicting evidence has shown that both sexes obtained similar scores across facets, despite their male oriented connotations (Brown et al., 2013; Jackson et al., 1992). These disparities have been attributed to self-report assessments of narcissism, which may induce sex differences in how a lack of empathy is encapsulated, thereby leading some researchers to assume stereotypical associations (Baez

et al., 2017). Moreover, despite the NPI's extensive use, measurement invariance has, to date, only been investigated by one study, which specifically focused on the exploitiveness/entitlement factor, which was considered antithetical to females, as the behaviour violates societal expectations (Tschanz et al., 1998). Although it was revealed that invariance between males and females was untenable, this narrative was refuted in studies where females mainly endorsed items pertaining to exploitiveness, whilst males validated indicators relating to leadership/authority and self-absorption/self-admiration (Brown et al., 2013; Corry et al., 2008; Jackson et al., 1992).

In terms of the Mach IV (Christie & Geis, 1970), qualitative intersex differences were embedded within the indicators of the measure, for example, 'Most men are brave'. The argument was made that the male inferences may have semantically different meanings for females comparatively to males (Miller et al., 2019). The latter authors revised the scale items, replacing 'men', with 'people', ultimately finding that even after replacing the sex-specific word with a generic term, the items were not invariant across males and females. Intersex differences further elucidated that, for males, Machiavellianism holds qualitatively different categories within the latent structure, whereby cut-off scores can be justified for males, whilst for females, the construct is best described on a continuum (Beller & Bosse, 2017). Yet, as attested by Brown and Guy (1983), the Mach IV does not assess female manipulative strategies, leading to the view that the scale is incompatible with the female manifestation of Machiavellianism.

Invariance of everyday sadism measures have received little scrutiny, however one study (Min et al., 2019), evaluated three widely used scales; the Short Sadistic Impulse Scale (SSIS: O'Meara et al., 2011), the Assessment of Sadistic Personality (ASP; Plouffe et al., 2017) and the Comprehensive Assessment of Sadistic Tendencies (CAST; Buckels & Paulhus, 2014). The SSIS showed metric invariance (equal factor loadings), the CAST provided partial metric invariance but not scalar invariance, whilst the ASP demonstrated configural invariance (unconstrained factor loadings). However, Min et al. (2019), assessed the ASP using multiple latent factors, which does not reflect the one latent factor of the scale, suggesting an inaccurate depiction of the ASP's invariance. This latter point was substantiated by Plouffe et al. (2021), who, through item response theory and differential item functioning, evidenced invariance of the ASP across groups.

The three scales were further investigated through differential item functioning analyses (Min et al., 2019). Whilst the CAST had three inequivalent items and the ASP had one, all SSIS items functioned equivalently between sexes. Confirming the findings for the ASP, Plouffe et al. (2021), also found that the same item was ineffective at assessing everyday sadism across samples, prompting the recommendation that it be removed from the scale. Ultimately, males and females with comparable levels of everyday sadism, responded differently to indicators (Min et al., 2019).

The two brief measures of the Dark Triad have conceptual differences, especially in terms of psychopathy, which may affect invariance. The Short Dark Triad (SD3; Jones & Paulhus, 2014), mainly addresses secondary psychopathy and the Dirty Dozen (DD: Jonason & Webster, 2010), aligns with primary psychopathy. These measures are actively used in research, however only one study to date, has considered sex invariance of the SD3 (Vaughan et al., 2019). The results elucidated that invariance could not be attained due to differing models between males and females, whereby discrepancies in the conceptualisations of the constructs were observed.

Conversely, evidence for the DD has been conflicting, depending on the methods used. Configural invariance was found for a bifactor model (Maneiro et al., 2018) and scalar invariance for the three-factor structure (Chiorri et al., 2019; Maneiro et al., 2018; Rogoza et al., 2021). Yet, employing Mokken scale analysis indicated a lack of sex invariance (Carter et al., 2015). Analysing the data by student and non-student males and females, a three-item factor which addressed narcissism and a six-item factor tapping into Machiavellianism-psychopathy emerged

for student men, whilst for females, the three-factor structure was maintained. However, for both non-student sexes, all twelve items formed a unidimensional scale. The Dark Triad has been associated with a male mating strategy (Jonason & Webster, 2010), yet, ironically, the scale was more robust for younger females than males.

Further analysis of the DD, using a graded response model, denoted that the number of females endorsing the lowest scale category was disproportionate to males (Kajonius et al., 2016). The authors contended that in studies with small sample sizes, this may robustly affect statistical and external validity. Finally, investigation of the brief measure of the Short Dark Tetrad (SD4; Paulhus et al., 2020), found scaler invariance across sex. However, the model with the best fit contained a reduced number of items (12 out of the original 28; Neumann et al., 2021). No further studies have yet investigated the sex invariance of the SD4.

On evaluation of the evidence, it is apparent that for many of the measures, the scales do not semantically or conceptually correspond at an intersex level. Although the Dark Tetrad has been and continues to be a prominent focus of empirical attention (Kay, 2021; Pineda et al., 2021), criticisms referring to the disparity between sexes are well-founded. Although previous research has attempted to refine existing measures, such as the Mach IV, to attain invariance (Miller et al., 2019), they concluded that revision of the scale was unfruitful and newer measures of Machiavellianism should be used. We consider that the expansive range of personality traits, represented by a broad scope of indicators (Rogoza & Cieciuch, 2018), within many Dark Tetrad measures, cannot achieve invariance across males and females.

Previous scales have been developed to measure specific traits which are entwined with dark personalities, for example, spitefulness (Marcus et al., 2014), exploitativeness (Brunell et al., 2013), schadenfreude (Crysel & Webster, 2018) and callous-unemotional traits (Kimonis et al., 2008). Although these scales do not address sex invariance, they provide a nuanced approach from which to investigate dark personalities. Overall, the lack of invariance in Dark Tetrad measures provides the justification for the development of a new scale, which offers an alternative perspective from which to assess dark personalities through a narrower lens. We propose that by doing so will facilitate more specific research focuses, with factors incorporating indicators which are invariant between males and females, ensuring mean group comparisons can confidently be made (Meade et al., 2008).

This article, therefore, documents the development and validation of a scale which measures dark personality constructs as they emerge from the male and female data, whilst aligning with theory and attaining invariance across sex. We begin development of the scale with sample one, where we anticipate that, with the synthesis of bottom-up and top-down statistical methods, the items and structure of the measure will be invariant across sex. With sample two, the construct validity of the scale is investigated, where we predict that convergent and discriminant validity will be shown with the relevant widely available Dark Tetrad scales (e.g., Levenson Self-Report Psychopathy Scale (Levenson et al., 1995)). Test re-test will be conducted with samples two and three, to establish temporal reliability of the measure, which we envisage will be achieved. Finally, the external validity of the scale will be considered with samples two and four, where we predict that the variance with the Big Five (Soto & John, 2017), and the personality inventory for DSM-5 (Krueger et al., 2012), will align with past research (Kowalski et al., 2019; Miller et al., 2013).

2. Method

2.1. Participants

Participants were recruited from the crowd data provider, Prolific. Inclusion criteria required that all participants were over 18 and fluent in English. They were also asked the sex they were assigned at birth, such as on an original birth certificate, to align with the focus of the studies.

Sample 1 initially contained 678 recorded responses. Eight participants had missing data, which were removed from the study, one participant preferred not to state their sex and two preferred to self-define. As a core focus of the study was the similarities and differences between males and females, these participants were removed from analysis. A final sample of 667 participants (334 males ($M_{age} = 30.77$, $SD = 11.65$); 333 females ($M_{age} = 28.52$, $SD = 10.22$)), contributed data to this study, with an age range of 18–73. There were 40.1% male students and 47.1% female students.

Sample 2 comprised 712 participants (348 females ($M_{age} = 29.57$, $SD = 9.83$); 364 males ($M_{age} = 28.20$, $SD = 9.63$)), with an age range of 18–70. There were 35.5% female students and 42.1% male students.

Sample 3 comprised 413 participants (196 females ($M_{age} = 30.1$, $SD = 10.27$); 217 males ($M_{age} = 29.09$, $SD = 9.89$)), with an age range of 18–70. There were 38.8% female students and 42.1% male students.

Sample 4 began with 626 recorded responses. Three participants chose not to state their sex and six preferred to self-define. Consistent with sample one, these participants were removed from analysis. A final sample of 617 participants contributed data to this study (309 females ($M_{age} = 27.70$, $SD = 8.12$); 308 males ($M_{age} = 27.52$, $SD = 8.66$)), with an age range of 18–59.

2.2. Measures

2.2.1. Sample 1

2.2.1.1. Scale development.
Personality characteristics considered for the new measure focused on the primary facet of psychopathy (Cleckley, 1941). There were several reasons for this approach. Secondary psychopathy has associations with high levels of dysfunctional negative emotionality, external comorbidities of substance abuse as well as symptoms of borderline personality disorder (Sellbom & Drislane, 2020). Consequently, secondary psychopathy may be a valid dimension in forensic and clinical populations but be disproportionate to the samples the measure seeks to assess. Although it is contended that excluding secondary psychopathy removes a salient dimension of the construct (Neumann et al., 2005), authors have suggested the facet should be omitted from measures which assess psychopathic traits in general population samples, whilst others have considered that it may be redundant (Boduszek, Dhingra, et al., 2016; Boduszek, Debowska, et al., 2016; Dinić et al., 2020).

Related to everyday sadism, there is a divergence of opinions as to whether pleasure is gained through the exertion of dominance or power, whereby power within relationships can be sustained through sadistic behaviours (O'Meara et al., 2011; Plouffe et al., 2017), or through acts of cruelty with no motivation of power (Book et al., 2015), both aspects will be considered. The grandiose and vulnerable facets of narcissism will be incorporated as will the range of Machiavellian characteristics.

The pool of 192 indicators were mainly taken from existing validated measures (e.g., Boduek, Debowska et al., 2016; Sherman et al., 2015), and were chosen based on theory, expert ratings (Miller, Hyatt, et al., 2017; Rosenthal & Hooley, 2010), and past research (Mullins-Sweatt et al., 2010). Some items were used verbatim, whereas others were adapted although still very similar to the original item (Christian & Sellbom, 2016). Everyday sadism indicators were further added to the pool which related to online trolling. These items were written based on theory (Buckels et al., 2019), as well as discussions with colleagues involved with the 'Don't feed the trolls' campaign (Center for Countering Digital Hate, 2020), to assess item construct, semantic and face validity, ensuring psychological relevance (Furr, 2011).

2.2.2. Sample 2
The Dark Side of Humanity Scale was developed in the first study with sample one. The DSHS is a 42-item scale, comprised of four factors, successful psychopathy, grandiose entitlement, sadistic cruelty and

entitlement rage and is measured on a six-point Likert scale. The options range from *not at all like me* (1), *mainly unlike me* (2), *a little unlike me* (3), *a little like me* (4), *mainly like me* (5), *very much like me* (6), in response to each item. Reliabilities have been found to be good, with successful psychopathy; $\alpha = 0.92$; grandiose entitlement; $\alpha = 0.90$; sadistic cruelty; $\alpha = 0.88$ and entitlement rage; $\alpha = 0.89$.

The Mach IV (Christie & Geis, 1970) comprises 20 items which are measured on a 7-point Likert scale from *strongly disagree* (1) to *strongly agree* (7). Items include 'Anyone who completely trusts anyone else is asking for trouble'. Females; $\alpha = 0.80$; males; $\alpha = 0.82$.

The Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995) is a 26-item scale which incorporates two factors. Primary psychopathy, measures callous and manipulative interpersonal characteristics and secondary psychopathy, taps into behavioural and antisocial facets. Measured on a four-point Likert scale *disagree strongly* (1) to *agree strongly* (4), items for primary psychopathy include, 'I often admire a really clever scam', and for secondary psychopathy, 'Love is overrated'. Primary females; $\alpha = 0.85$; males; $\alpha = 0.87$; Secondary; females; $\alpha = 0.72$; males; $\alpha = 0.65$.

Narcissistic Personality Inventory (NPI: Raskin & Hall, 1979), comprises 40 items and is scored on a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5). Example items include 'I am an extraordinary person'. Females; $\alpha = 0.93$; Males; $\alpha = 0.93$.

The Assessment of Sadistic Personality (ASP; Plouffe et al., 2017) comprises nine items which measure everyday sadism and are rated on a 5-point Likert scale *strongly disagree* (1) to *strongly agree* (5). Scale items consist of statements such as 'Watching people get into fights excites me'. Females; $\alpha = 0.88$; males; $\alpha = 0.85$.

Big Five Inventory-2 (BFI-2: Soto & John, 2017) is a 60-item self-report scale of core personality traits: Negative Emotionality, Extraversion, Open-Mindedness, Agreeableness and Conscientiousness. Participants rate their agreement using a 5-point Likert type scale ranging from *disagree strongly* (1) to *agree strongly* (5). Each subscale is comprised of 12 items and the values obtained by averaging the scores together. Items are short, descriptive phrases, which all begin with 'I am someone who…', followed by item-specific content, for example, 'has a forgiving nature'. Extraversion; females; $\alpha = 0.84$; males; $\alpha = 0.81$; agreeableness; females; $\alpha = 0.82$; males; $\alpha = 0.80$; conscientiousness; females; $\alpha = 0.86$; males; $\alpha = 0.84$; negative emotionality; females; $\alpha = 0.91$; males; $\alpha = 0.89$; open-mindedness; females; $\alpha = 0.82$; males; $\alpha = 0.78$.

2.2.3. Sample 3
The Dark Side of Humanity Scale. Details above.

2.2.4. Sample 4
Personality Inventory for DSM-5-Brief Form (PID-5-BF; Krueger et al., 2012) is a 60-item self-report measure that assesses five broad pathological personality trait dimensions each containing 12 items; antagonism (e.g., 'I use people to get what I want' (females; $\alpha = 0.88$; males; $\alpha = 0.91$); disinhibition, 'I'm good at conning people' (females; $\alpha = 0.88$; males; $\alpha = 0.88$); detachment, 'I keep my distance from people' (females; $\alpha = 0.87$; males; $\alpha = 0.88$); negative affectivity, e.g., 'I get emotional easily, often for very little reason' (females; $\alpha = 0.90$; males; $\alpha = 0.90$) and psychoticism 'Others seem to think I'm quite odd or unusual' (females; $\alpha = 0.90$; males; $\alpha = 0.88$). Each dimension was scored on a scale that ranged from 0 (*very false or often false*) to 3 (*very true or often true*).

2.3. Procedure

Invitations to participate in the online surveys for the four studies were posted on the crowd-data provider, Prolific. All participants were required to be 18 years old and over and fluent in English. Initially, all participants who completed the online surveys, provided informed consent. They further provided demographic information and completed the series of questionnaires. The scales were administered in random order as were the items in each measure. Participants were then debriefed, thanked and paid for their time. Ethical approval for all studies was received from the University Ethics Committee.

2.4. Analytical procedure

The development process used both top-down and bottom-up approaches and symbiotically combined exploratory graph analysis (EGA), the Generalised Partial Credit Model (GPCM) and confirmatory factor analysis (CFA). All analyses were conducted in R Studio, Version 1.2.1335 and samples across studies were split to investigate the male and female data separately.

Item reduction began with redundancy analysis, from the EGAnet package (Golino & Christensen, 2020). A similarity measure is calculated between the regularized partial correlations of the nodes using weighted topological (global structure) overlap from the wTO package (Gysi et al., 2018). The adaptive alpha applies multiple comparison corrections to determine which scale items are redundant (Epskamp et al., 2018), by focusing on pairwise relationships between the indicators. Items considered redundant are further assessed based on theory and semantic representation (Christensen et al., 2020). Following this, EGA, using the EGAnet package (version 0.9.8; Golino & Christensen, 2020), elucidated the dimensionality of the data, whereby the emerging network does not depend upon theory or a priori assumptions but is determined solely by the data. This facilitates the appraisal of the theoretical structure (Christensen, Gross, et al., 2019), through clusters which represent underlying latent variables (Epskamp & Fried, 2018). The EGA used a Gaussian Graphical Model (GGM), where the data was estimated at item level, with the graphical least absolute shrinkage and selection operator (GLASSO) and the 'Walktrap' algorithm. Previous research has shown that network models can determine the number of latent dimensions in psychological and personality data including openness to experience and dark personality research (Christensen, Cotter, & Silvia, 2019; Dinić et al., 2020; Truhan et al., 2020).

The remaining scale indicators were then assessed using the Generalised Partial Credit Model (GPCM; Muraki & Muraki, 2016), which comes under the umbrella of item response theory. Models of item level statistics are produced, whereby each scale indictor is uniquely validated and remains valid even when a subset of the items is used (An & Yung, 2014; Edelen & Reeve, 2007). Thus, the same items can be used with different samples, whilst keeping their statistical properties (Zanon et al., 2016). The model is assessed through two main parameters. The slope or discrimination parameter (a), shows how well the indicator identifies participants at differing levels of the latent trait, with a high value denoting a strong item (Adedoyin & Mokobi, 2013; An & Yung, 2014), whilst the threshold or step difficulty parameter (b), indicates the level of the latent trait where participants move from one scale category to the next. For example, if at step one ($b1$), the value is negative or low, the probability is more likely that participants move up a step to option two on the scale. However, if the b value for step 4 is higher than step 5, this indicates that participants need higher levels of the latent construct to endorse the higher scale options (Embretson & Reise, 2000; Gomez, 2008). The number of step difficulty parameters (b) is equal to the number of categories minus one (Embretson & Reise, 2000). Based on the guidelines by Baker (2001), the slope values are determined by: very low (0.01–0.34), low (0.35–0.64), moderate (0.65–1.34), high (1.35–1.69) and very high (>1.70).

The final four-factor model was tested through an exploratory graph confirmatory factor analysis (CFA) as well as through a traditional CFA across sexes and samples. This model was then assessed for sex

invariance. To provide evidence of the scale's validity, associations were compared between the DSHS and theoretically expected associations with a range of external measures, as well as test re-test reliability.

3. Results

Item redundancy analysis facilitated the removal of items and provided an initial view of which indicators were homogenous across groups. This process was a synthesis of examining both the partial correlation plot and the edges between items, which denoted redundancies determined to be statistically significant (Christensen et al., 2020), as well as the semantic content of the suggested items. For example, comparing the Machiavellian item 'I get so emotional that I can't think straight' (R), with both 'When I'm under a great deal of stress, sometimes I feel like I'm going to pieces' (R) and 'People would describe me as emotionally stable', the latter item was retained for two reasons. The first two items were reverse scored, yet as argued by Menold (2020), reverse keyed indicators can negatively affect scales, whereby reliability and validity can be diminished. In light of this, reverse scored items have been discouraged in measures where samples may be heterogenous (Menold, 2020). The retained item also aligned with the characteristics of the construct, with no semantic ambiguities.

This process continued for all indicators, consequently reducing the item pool for each construct across sex. The items were then analysed with exploratory graph analysis (see Online supplementary materials 2). For both males and females, everyday sadism clearly emerged as a cluster with Machiavellian and psychopathy items predominantly found on one dimension. Several narcissism and psychopathy indicators cross loaded, whilst narcissism clustered on three elements for both groups: two related to grandiose entitlement and entitlement rage, with divergence on the third cluster, with males aligning with shame and devaluing of the self and females with contingent self-esteem and shame.

Due to the discrepancies, the Generalised Partial Credit Model (GPCM) was employed to explore the indicators in further depth using the mirt package (Chalmers, 2012). The data for narcissism was separated into the grandiose and vulnerable facets, Machiavellianism and psychopathy were retained within their own factors as well as everyday sadism. The slope parameters (*a*) indicated how well the items discriminated across the different levels of the underlying construct.

The initial GPCM analysis highlighted the items which had low slope values (*a* < 0.65; Baker, 2001), and these indicators were discarded. The ensuing GPCM culminated in the remaining items being homogenous across samples, with each item falling within the accepted slope values as well as addressing core facets of the constructs (Table 1).

The GPCM indices serve to highlight a limitation of classical test theories (CTT's), which assume that measurement precision is constant

Table 1
Dark Side of Humanity Scale slope parameters and item locations for males and females.

Item	Females						Males					
	a	b1	b2	b3	b4	b5	*a*	b1	b2	b3	b4	b5
P7	1.00	1.03	0.58	1.50	2.55	2.66	0.86	−0.80	0.55	0.68	1.50	3.22
P9	0.84	0.66	0.25	0.66	2.00	2.46	0.74	−1.14	0.25	0.02	1.87	1.98
P10	1.87	1.27	0.68	1.65	1.86	2.26	1.14	−0.34	0.71	0.91	1.72	2.74
P12	1.35	1.40	0.29	0.92	2.47	2.02	1.28	−0.43	0.31	0.71	1.62	1.63
P13	1.03	1.00	−0.07	0.76	2.59	2.43	1.11	−0.22	−0.04	0.57	1.55	2.02
P14	1.34	1.45	0.72	1.24	2.06	1.95	1.22	0.27	0.72	0.70	1.74	2.67
P15	1.39	0.97	0.17	1.13	2.28	2.49	1.19	−0.60	0.17	0.38	1.42	1.99
P17	1.72	0.95	0.23	1.25	2.30		1.96	−0.36	0.24	0.52	1.65	2.20
P18	1.46	0.82	0.08	1.51	2.17		2.04	−0.22	0.10	0.48	1.21	1.87
P22	1.33	0.75	−0.27	1.10	2.08	2.00	1.10	−1.27	−0.28	0.30	1.44	2.21
P27	0.94	0.92	0.49	0.79	2.16	2.17	0.98	0.07	0.51	0.01	1.85	2.01
M3	0.84	−0.35	1.11	0.26	3.40	3.07	0.97	−0.84	0.20	−0.30	2.28	2.00
M10	0.88	0.34	1.86	1.55	2.32	2.96	0.93	0.03	0.93	0.88	1.74	4.72
M23	1.10	−0.47	0.91	0.64	2.50		1.08	−1.48	0.18	−0.35	1.88	2,18
M24	0.83	−1.06	0.20	0.50	2.19	3.03	0.70	−1.94	−0.91	0.30	2.07	2.31
M26	1.43	−0.49	0.68	1.02	2.38	3.18	1.34	−0.64	0.28	0.60	1.77	2.36
M28	2.26	−0.23	0.63	1.20	2.12		1.27	−0.53	0.06	0.54	1.88	1.78
M29	1.51	−0.50	1.26	1.41	2.44	2.87	1.95	−0.30	0.44	0.83	1.97	2.01
N1	2.39	0.29	0.87	1.05	2.40		1.76	0.07	0.59	1.06	1.58	2.36
N2	3.55	0.42	0.83	1.23	1.88		3.47	0.15	0.69	0.95	1.63	2.18
N3	4.46	0.42	0.61	1.16	2.05		2.59	0.22	0.61	0,83	1.64	2.51
N4	1.00	0.05	0.32	0.14	2.22	2.14	0.99	−0.22	0.32	0.44	1.49	1.97
N5	1.72	0.58	0.45	1.25	1.82		1.52	0.33	0.44	0.99	1.52	1.53
N7	1.94	0.69	0.69	1.43	2.42	2.48	1.17	0.52	0.69	0.86	2.06	1.50
N8	2.15	0.36	0.48	1.08	1.95		1.66	0.09	0.48	0.65	1.76	2.48
N9	1.33	0.77	0.76	1.14	1.93	3.33	0.96	0.50	0.76	0.81	2.45	1.96
N10	1.19	1.16	0.99	0.99	2.27	3.25	1.13	0.60	0.99	0.81	1.99	1.52
S4	0.95	1.45	1.41	1.39	3.10	3.17	0.96	0.73	0.87	0.63	1.92	2.58
S8	3.53	0.93	1.54	1.58	2.02	2.28	1.99	0.22	0.88	1.19	1.73	2.06
S10	4.20	1.09	1.47	1.79	1.91	2.27	1.95	0.57	1.09	0,98	1.59	2.04
S12	1.29	1.14	1.54	0.83	2.87	1.52	1.06	0.72	1.05	0.17	1.72	1.58
S13	2.86	1.11	1.58	1.40	2.34	1,72	2.20	0.55	0.98	0.76	1.82	2.20
S15	1.55	1.40	1.48	1.79	2.70	1.97	1.76	0.75	0.76	1.06	2.06	1.32
S24	1.33	2.19	2.26	1.18	2.13	3.04	1.58	1.16	1.30	1.06	1.96	2.37
S32	2.15	1.43	1.91	2.32	1.69	2.71	1.33	1.22	1.13	0.94	2.17	2.23
N23	0.86	−0.27	0.44	−0.98	1.93	2.54	0.86	−0.60	−0.27	−0.06	2.01	2.05
N25	1.36	−0.27	0.31	0.43	2.17	3.46	1.24	−0.76	0.20	0.46	2.02	2.19
N26	1.61	−0.50	0.29	0.25	1.56	1.92	1.09	−0.77	−0.20	0.01	1.58	1.84
N28	1.57	−0.34	0.98	0.71	1.57	2.68	1.71	−0.04	0.57	0.73	1.53	2.04
N29	2.09	0.64	1.12	1.52	2.23	2.30	1.08	0.40	0.53	1.09	2.03	2.04
N31	2.09	0.23	0.74	0.68	1.84		2.12	−0.20	0.36	0.71	1.64	2.09
N33	1.84	0.55	1.23	1.04	2.13	2.39	1.70	0.11	0.77	1.15	1.69	2.07

Note: *a* = slope parameters; *b* = item location; P = psychopathy; M = Machiavellianism; N1-N10 = grandiose narcissism; S = everyday sadism; N23 = N33 = vulnerable narcissism.

across the spectrum of the latent construct, yet it can be seen specifically in the female group that this is not the case. Across constructs, except for everyday sadism, the sixth point on the scale was not utilised for all indicators, a variance between groups which is elusive in exploratory factor analysis. Indeed, scales developed solely through CTT's are more likely to have an unequal dissemination of accuracy across the normal range of the construct and do not indicate the degree of the latent trait the items tap into, whereas the GPCM elucidates the range (Fraley et al., 2000).

The GPCM items were then investigated with a further EGA, whereby, the nodes (circles) represent the variables and edges (lines), represent the conditional dependence (partial correlations) between nodes and denote statistical relationships (Epskamp & Fried, 2018). For both males and females, all items clustered onto their own factors, with no discrepancies between groups (Fig. 1).

Finally, using the EGA model, a confirmatory factor analysis (CFA), was conducted with the WLSMV estimator for each group. Unlike a specified model with a traditional CFA, the model emerges from the EGA. Traditional CFA scores are generally calculated using a simple structure with regression methods, whereby items only load on one factor. Network scores, however, are computed using a complex structure based on a weighted composite rather than a latent factor (Christensen & Golino, 2020). The EGA CFA models corroborated the EGA graphs, whereby for both groups, all indicators loaded onto the four clusters of Machiavellianism/psychopathy, grandiose narcissism, vulnerable narcissism and everyday sadism, with a good model fit; females ($\chi^2 = 1101.55$, $df = 813$, $p = .99$, CFI = 0.91, RMSEA = 0.03); males ($\chi^2 = 1103.90$, $df = 813$, $p = 1.00$, CFI = 0.94, RMSEA = 0.03).

The final factors were labelled, successful psychopathy, grandiose entitlement, sadistic cruelty and entitlement rage under the umbrella of the Dark Side of Humanity Scale (Table 2). Each factor had acceptable estimates of internal reliability across groups, based on α and ω. Specifically for the range of alpha reliabilities: Successful psychopathy; 0.93 to 0.95, grandiose entitlement; 0.90 to 0.92, sadistic cruelty; 0.88 to 0.90 and entitlement rage; 0.87 to 0.92 across samples (internal consistencies, mean scores and standard deviations for all samples, are available in Online supplemental materials 1).

3.1. Confirmation and stability of structure

To replicate the four-factor structure of the DSHS and to further ascertain if this structure was stable across samples and time, a CFA was conducted with samples two, three and four. The estimator for the CFA was set as weighted least means and variance (WLSMV) and the model fit assessed using Confirmatory Fit Index (CFI), Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). A good model fit was determined when CFI and TLI values were more than or equal to 0.90, in line with Kline's (2015), recommendations. RMSEA values evidenced a good fit if they were 0.06 or below and an adequate model fit was accepted at 0.08 or below. Models were rejected if they displayed a value above 1.0 (Brown, 2015; Marsh et al., 2004).

The models corroborated the EGA CFA in the previous study for the four-factor structure by showing a good fit to the data; Sample 2; males ($\chi^2 = 1163.44$, $df = 813$, $p < .001$, CFI = 0.91, TLI = 0.90, RMSEA = 0.03 [CI 0.03–0.04]); females ($\chi^2 = 1110.57$, $df = 813$, $p < .001$, CFI = 0.91, TLI = 0.90, RMSEA = 0.03 [CI 0.03–0.04]). Sample 3: males ($\chi^2 = 1710.59$, $df = 813$, $p < .001$, CFI = 0.95, TLI = 0.94, RMSEA = 0.05 [CI: 0.05–0.06]); females ($\chi^2 = 1477.41$, $df = 813$, $p < .001$, CFI = 0.96, TLI = 0.96, RMSEA = 0.05 [CI: 0.04–0.05]). Sample 4; females ($\chi^2 = 947.38$, $df = 813$, $p < .001$, CFI = 0.93, TLI = 0.93, RMSEA = 0.02 [CI: 0.02–0.03]); males ($\chi^2 = 961.31$, $df = 813$, $p < .001$, CFI = 0.96, TLI = 0.95, RMSEA = 0.02 [CI: 0.02–0.03]).

3.2. Measurement invariance

One of the main aims of developing the DSHS was to ensure invariance across males and females, which was tested through nested CFA models. The CFI and RMSEA considerations were the same as the CFA criteria already discussed. Research has shown that comparing models based on a chi-squared difference test are impacted by the same issues as the chi-squared goodness of fit test, with the change in CFI being less sensitive to sample size than the chi-square and more sensitive to lack of invariance than chi-square (Meade et al., 2008). Thus, if the difference in the fit indices (ΔCFI and ΔRMSEA) between a model and the preceding less constrained model was not larger than 0.01 for ΔCFI and equal or less than 0.015 for ΔRMSEA, then it was considered that the level of measurement invariance was achieved (Marsh et al., 2013; Rudnev et al., 2018).
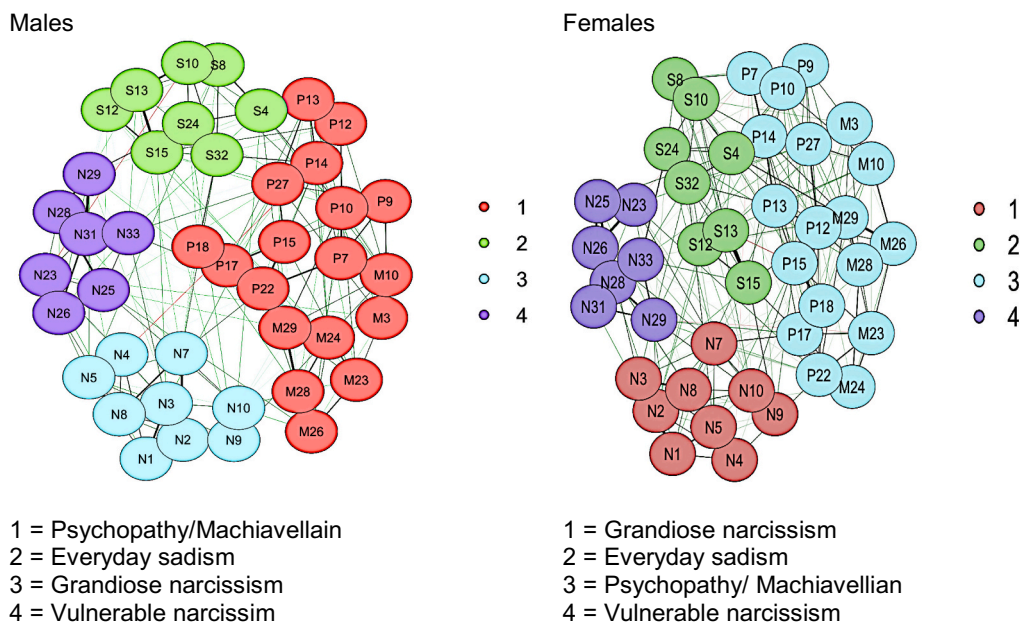

Fig. 1. EGA model of the Dark Side of Humanity Scale.

Males

1 = Psychopathy/Machiavellain
2 = Everyday sadism
3 = Grandiose narcissism
4 = Vulnerable narcissim

Females

1 = Grandiose narcissism
2 = Everyday sadism
3 = Psychopathy/ Machiavellian
4 = Vulnerable narcissism

Table 2

The Dark Side of Humanity Scale.

N	Item
	Successful psychopathy
1	It's wise to keep track of information that I can use against people.
2	What other people feel doesn't concern me.
3	The only good reason I talk to others is to get information that I can use to my benefit.
4	I can be good at pretending to care about people but must of the time I really don't care.
5	It's sometimes fun to see how far I can push someone before they catch on.
6	Success is based on survival of the fittest, I am not concerned about the losers.
7	I could look people straight in the eye and it means nothing to me to lie or to cheat them.
8	I can simulate emotions like pain and hurt to make others feel sorry for me.
9	I am willing to be unethical if I believe it will help my plans succeed.
10	For me, what's right is whatever I can get away with.
11	I believe that lying is necessary to maintain a competitive advantage over others.
12	If I'm honest all the time it won't lead to the success of my objectives.
13	I am willing to sabotage the efforts of other people if they threaten my own goals.
14	I don't care much if what I do hurts others.
15	In today's world, I feel justified in doing anything I can get away with.
16	Playing by the rules sounds nice but getting what I want is more important.
17	I will break a promise if it works to my advantage.
18	People might describe me as mean and cruel.
	Grandiose entitlement
1	I deserve to receive special treatment
2	I expect people to bend the rules for me.
3	I tend to expect special favours from others
4	I deserve to get what I want.
5	I deserve more out of life than other people.
6	I don't think the rules apply to me as much as they apply to others.
7	I expect to be treated better than average.
8	I only associate with people of my calibre.
9	I do not waste my time hanging out with people who are beneath me.
	Sadistic cruelty
1	It gives me pleasure to see someone successful get fired.
2	I enjoy seeing people hurt.
3	I have fantasies which involve hurting other people.
4	Hurting people would be exciting.
5	I post offensive comments on social media forums just so I can take pleasure from the hurt I cause.
6	I would hurt somebody if it meant that I would be in control.
7	I get pleasure from mocking people in front of their friends.
8	I enjoy watching people in pain.
	Entitlement rage
1	It irritates me when people don't notice how good I am.
2	I get into a temper if I don't get the recognition that I deserve.
3	I can get pretty angry when others disagree with me.
4	I hate being criticised so much that I can't control my temper when it happens.
5	It really makes me angry when I don't get what I deserve.
6	I fly into a rage if somebody expects me to do tasks that are really beneath my skill level.
7	I can get really nasty if I don't get what I want.

Initially, the configural invariance model, with unconstrained factor loadings was calculated which served as the baseline for metric invariance, which tests for equal factor loadings, followed by scalar invariance, which investigates equal factor loadings and item thresholds, whereby intergroup mean scores can meaningfully be compared (Meade et al., 2008; Table 3).

The four-factor model evidenced scalar invariance across all groups, which indicates that multi-group comparisons of factor means and statistically significant intergroup mean differences would not be due to disparities in scale properties across sex (Bialosiewicz et al., 2013).

3.3. Construct validity of the DSHS

Given that the factor structure of the Dark Side of Humanity Scale (DSHS), was shown to be stable, the construct validity of the measure was investigated with the Levenson Self-Report Psychopathy Scale

(LSRP; Levenson et al., 1995), the Mach IV (Christie & Geis, 1970), the Narcissistic Personality Inventory (Raskin & Hall, 1979) and the Assessment of Sadistic Personalities (ASP; Plouffe et al., 2017). This was conducted using the R packages bootnet and relaimpo, with which relative importance networks were determined by the normalised lmg metric, which is the R^2 contribution averaged over orderings among regressors (Groemping & Matthias, 2021). These networks are weighted (partial correlations) and directed such that the directed edges quantify the relative contribution of one scale as a predictor of another.

Specifically, the relative importance denotes the proportionate contribution that measures, for example, the LSRP primary factor, makes to R^2 (where the DSHS factor, successful psychopathy is the criterion). It considers both the correlation between the factors and the effect the criterion variable has on the dependent variable, adjusted for the influence of other measures in the network. In doing so, relative importance should better address the possibility that measures are only associated because of their shared association with the latent construct (Robinaugh et al., 2014; Table 4).

Convergence was shown between the DSHS factors and the relevant dark personality measure. The Narcissistic Personality Inventory showed a stronger relationship with grandiose entitlement over entitlement rage, which is unsurprising as the scale mainly addresses the grandiose form of narcissism (Corry et al., 2008; Rosenthal & Hooley, 2010). Conversely, entitlement rage showed a stronger association with the LSRP secondary factor. The characteristics of secondary psychopathy as determined by the LSRP, tap into a self-defeating lifestyle, intolerance of frustration and quick temperedness (Levenson et al., 1995), features which may align with the ethos of narcissistic entitlement rage.

3.4. Temporal reliability of the Dark Side of Humanity Scale

A longitudinal structural model regressed the four DSHS factors at Time 2 on Time 1 to establish and provide evidence of the stability of the facets over time. Participants from sample two were invited to respond to the survey once more, sixteen days later (sample three; Berchtold, 2016). This time lapse was chosen over the two-weeks suggested by Watson (2004), to enable participants to withdraw their data from the study, if they so wished and with the aim of preventing any impact from memory effects (Schmidt et al., 2003). Salient life events such as family bereavement can influence affective traits more so than the more stable characteristics of the Big Five (Vaidya et al., 2008), and sixteen days is a close enough timeframe in which the traits being measured are not expected to change, whereby the effect of contextual factors should be insignificant (Chmielewski & Watson, 2009). Test-retest reliability was further evaluated using intraclass correlations.

The CFA model provided a good fit to the data; females ($\chi^2 = 3475.81$, $p = .13$, CFI = 0.96, TLI = 0.96, RMSEA = 0.01 [CI: 0.00–0.02]); males ($\chi^2 = 3555.00$, $p = .02$, CFI = 0.95, TLI = 0.95, RMSEA = 0.01 [CI: 0.01–0.02]). Scores were also stable across time based on intraclass (ICC; 3 k estimation) correlations; SP; females ICC = 0.80 [CI = 0.75–0.84], $F(193,193) = 5.05$, $p < .001$; males ICC = 0.85 [CI = 0.81–0.88], $F(218,218) = 6.50$, $p < .001$; GE; females ICC = 0.77 [CI = 0.70–0.82], $F(193,193) = 4.30$, $p < .001$; males ICC = 0.82 [CI = 0.77–0.86], $F(218,218) = 5.50$, $p < .001$; SC; females ICC = 0.71 [CI = 0.63–0.77], $F(193,193) = 3.40$, $p < .001$; males ICC = 0.77 [CI = 0.72–0.82], $F(218,218) = 4.40$, $p < .001$; ER; females ICC = 0.79 [CI = 0.73–0.83], $F(193,193) = 4.70$, $p < .001$; males ICC = 0.75 [CI = 0.68–0.80], $F(218,218) = 4.00$, $p < .001$.

A high degree of reliability was found between the DSHS at time 1 and time 2. The ICC's were all within a good range (0.71–0.85), thus, combined with the longitudinal models, the evidence suggests temporal stability was established.

3.5. External validity of the DSHS

To investigate the nomological network of the DSHS, the normative

Table 3

Male and female measurement invariance model fit indexes for the DSHS using WLSMV and robust values.

Models	χ^2	p	df	CFI	TLI	RMSEA [CI]	ΔCFI	ΔRMSEA
Sample 2								
Configural	2204.95	<.001	1626	0.930	0.926	0.033 [0.03–0.04]		
Metric	2165.39	<.001	1664	0.939	0.937	0.030 [0.03–0.03]	−0.009	−0.003
Scalar	2216.00	<.001	1702	0.938	0.937	0.030 [0.03–0.03]	−0.001	0.000
Sample 3								
Configural	1805.98	<.001	1722	0.940	0.937	0.019 [0.01–0.02]		
Metric	1917.10	<.001	1664	0.936	0.934	0.023 [0.02–0.03]	−0.004	0.004
Scalar	1970.52	<.001	1702	0.931	0.931	0.023 [0.02–0.03]	−0.005	0.000
Sample 4								
Configural	1908.95	<.001	1626	0.947	0.944	0.024 [0.02–0.03]		
Metric	1940.98	<.001	1664	0.948	0.946	0.023 [0.02-,03]	−0.001	−0.001
Scalar	2006.22	<.001	1702	0.943	0.942	0.024 [0.02–0.03]	−0.005	−0.001

Note: df = degrees of freedom; CFI = Confirmatory Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square of Approximation; DSHS=Dark Side of Humanity Scale.

Table 4

Construct validity of the DSHS factors.

	Successful psychopathy		Grandiose entitlement		Sadistic cruelty		Entitlement rage	
	R^2	$_pr$	R^2	$_pr$	R^2	$_pr$	R^2	$_pr$
Female								
LSRP P	**0.22**	**0.33**	0.12	0.24	0.12	0.22	0.09	0.17
LSRP S	0.09	0.13	0.04	0.07	0.06	0.12	0.13	0.24
NPI	0.06	0.09	**0.18**	**0.35**	0.02	0.02	**0.11**	**0.21**
MACH IV	**0.17**	**0.25**	0.06	0.13	0.09	0.17	0.10	0.18
ASP	0.12	0.18	0.10	0.20	**0.24**	**0.43**	0.11	0.19
Male								
LSRP P	**0.28**	**0.40**	0.15	0.29	0.11	0.22	0.09	0.20
LSRP S	0.06	0.08	0.04	0.07	0.05	0.10	0.12	0.27
NPI	0.06	0.08	**0.17**	**0.32**	0.02	0.05	**0.10**	**0.24**
MACH IV	**0.16**	**0.22**	0.06	0.11	0.06	0.13	0.04	0.10
ASP	0.15	0.21	0.10	0.20	**0.25**	0.50	0.07	0.17

Note: R^2 values are based on the proportion of variance one construct explains in another construct after controlling for all other constructs; $pr = partial$ correlation determined by edge weight; LSRP P = Levenson Self-Report primary factor; LSRP S = Levenson Self-Report secondary factor. The figures in bold indicate the relevant Dark Tetrad scale with the associated DSHS factor.

personality traits of the Big Five have historically been considered fundamental in personality research, as they constitute a shared narrative from which those who embody dark personality characteristics can be described (Jonason et al., 2013). For example, a positive relationship with agreeableness and conscientiousness would indicate personality stability, where compassion, respect and trust of others are embodied, as well as the extent of responsibility, organisation and productivity held (Soto et al., 2016). However, at the centre of dark personality traits, there is an intimation of personality instability, dogmatism and a reluctance to change (Spain et al., 2014), and suggests the extent to which an individual may be emotionally volatile (Soto et al., 2016).

Yet, the personality inventory for DSM-5 (PID-5; Krueger et al., 2012), considered to be the maladaptive version of the Big Five, has surpassed the latter as predictors of dark personality constructs, such that they facilitate the identification of overlapping facets and discriminant characteristics (Grigoras & Wille, 2017).

The five domains of the PID-5 are suggested to be the extreme and maladaptive variants of the 'normal' personality constructs of the Big Five. Negative affectivity relates to extreme negative emotionality, including anxiety, depression and interpersonal dependency. Detachment is the converse to extraversion, tapping into refrainment from socioemotional experiences and includes withdrawal from interpersonal interactions and constrained emotional expressions and experiences. Antagonism pertains to the extreme lower end of the agreeableness spectrum and incorporates grandiosity, entitlement, callousness and

manipulation. Disinhibition is the converse of conscientiousness, whereby individuals seek immediate gratification, which may lead to behaviours enacted without consideration of past experiences or possible consequences. Finally, psychoticism although distinctive, overlaps with open mindedness. The latter Big Five domain, tends to accentuate positive content such as intellectual curiosity and aesthetic sensitivity, whereby psychoticism assesses a far more negative content, such as problems with fantasies encroaching on daily life (De Fruyt et al., 2013). As the DSHS measures dark personalities from an alternative viewpoint and specifically assesses the darker side of human nature, the PID-5 will provide an alternative perspective, alongside the Big Five, on the normal and maladaptive facets and their relationships with the DSHS factors. It was hypothesised that the PID-5 regression models would show a greater variance with the DSHS factors than the Big Five models (regression summary models can be found in Supplementary material 3 and 4).

To account for the associations among the discussed constructs, two hierarchical regressions were conducted: the Big Five with sample two, whereby the Big Five constructs were regressed onto each DSHS factor; the same was done with the PID-5 domains using sample four (Table 5). Supplemental analysis (Online supplementary material 4) investigated the correlations and variance between the DSHS facets, the PID-5 and Big Five domains. The means and reliabilities of all scales can be found in Supplementary material 5. A power analysis using the R package 'pwr' (Champely et al., 2020), determined for the regression, that the minimum sample required for a medium effect size, with power of 0.80 and significance level of 0.001, was 149.

Comparatively to the Big Five and as predicted, the PID-5 mainly explained the DSHS factors to a greater extent corroborating previous research suggesting the PID-5 constructs outperform the Big Five when they are considered as predictors of the dark personality facets (Grigoras & Wille, 2017). Indeed, the literature has evidenced that the PID-5 model, has accounted for a substantial proportion (i.e., R^2 larger than 0.50), of the variance with dark personality constructs (Miller et al., 2013; Strickland et al., 2013), in relation to narcissistic personality disorder and psychopathy. This was specifically found in the current study, with successful psychopathy and grandiose entitlement.

Both the Big Five and the PID-5 models provided a similar explanation for sadistic cruelty with both being driven by negative agreeableness/antagonism for males and females. The only divergence was in the Big Five male model, which showed a lack of open-mindedness in relation to sadistic cruelty and in the PID-5 with detachment and its relationship with grandiose entitlement and sadistic cruelty. The female group showed a relationship with psychoticism and successful psychopathy, as well as grandiose entitlement, whilst for males, the association was only with grandiose entitlement. This serves to highlight the idiosyncrasies in the manifestation of the constructs across sex (Grigoras & Wille, 2017).

Table 5
Hierarchical regression with the Big Five and PID-5.

	Successful psychopathy		Grandiose entitlement		Sadistic cruelty		Entitlement rage	
	BF	PID-5	BF	PID-5	BF	PID-5	BF	PID-5
Females								
BF AG	−0.55***	–	−0.44***	–	−0.47***	–	−0.45***	–
PID-ANT	–	0.64***	–	0.66***	–	0.37***	–	0.37***
BF EX	0.08	–	0.16**	–	0.00	–	−0.18***	–
PID DET	–	0.10*	–	−0.00	–	0.09	–	−0.08
BF NE	−0.03	–	−0.05		−0.01	–	0.13**	–
PID NA	–	−0.06	–	−0.01	–	−0.03	–	0.22***
BF CON	−0.09	–	−0.07		−0.09	–	−0.15**	–
PID DIS	–	0.19	–	0.10*	–	0,09	–	0.20***
BF OM	−0.05	–	0.05		−0.04	–	0.05	
PID PSY	–	0.10*	–	0.13**	–	0.08	–	0.16**
Males								
BF AG	−0.69***	–	−0.54***		−0.39**	–	−0.42***	–
PID-ANT	–	0.67***	–	0.66***	–	0.43***	–	0.42***
BF EX	0.10*	–	0.25***		0.06	–	−0.16**	–
PID DET	–	0.20***	–	0.10*	–	0.22***	–	0.05
BF NE	−0.15***	–	0.01		0.04	–	0.19***	–
PID NA	–	−0.08	–	0.12*	–	−0.08	–	0.21***
BF CON	−0.13**	–	−0.05		−0.10	–	−0.06	–
PID DIS	–	0.09	–	−0.10*	–	0.08	–	0.17**
BF OM	−0.02	–	0.04		−0.10*	–	0.05	–
PID PSY	–	0.06	–	0.17***	–	0.05		0.03
R^2 F BF	0.33	–	0.21		0.23	–	0.29	
R^2 M BF	0.49	–	0.32		0.20	–	0.25	
R^2 F PID	–	0.63	–	0.57	–	0.23	–	0.44
R^2 M PID	–	0.58	–	0.55	–	0.28	–	0.41

Note: Standardised regression coefficients (β) are reported: *$p < .05$; **$p < .01$; ***$p < .001$; AG = agreeableness; EX = extraversion; CON=conscientiousness; NE = negative emotionality; OM = open mindedness; NA = negative affect; DET = detachment; ANT = antagonism; DIS=disinhibition; PSY=psychoticism: R^2 F BF = R^2 Females Big Five: R^2 M BF = R^2 Males Big Five; R^2 F PID = R^2 Females PID-5; R^2 M PID = R^2 Males PID-5.

Historical relationships with the Big Five were also shown with negative conscientiousness and agreeableness (Kowalski et al., 2019; Paulhus et al., 2020). The four DSHS constructs were driven by disagreeableness in the Big Five model and by antagonism in the PID-5 model. In sum, the evidence suggests the DSHS provides convergent and discriminant validity across the nomological network of the PID-5 and Big Five.

4. General discussion

The aim of this study was to develop a scale which measured the dark personality traits, invariantly across males and females. The culmination is the Dark Side of Humanity Scale (DSHS), which measures the Dark Tetrad (DT), constructs from an alternative viewpoint. The methods used in the development of the DSHS and the decision to move away from solely using traditional methods of classical test theories (CTT), was brought about by discussions which asserted that the topology of the constructs under investigation can be analysed in a way that CTT methods cannot provide (Hevey, 2018). Synthesising methods which move from a graphical model, which focused on the estimation of direct relationships between the indicators through the inverse covariance matrix to a latent factor model (Golino & Epskamp, 2017), and applying the four-factor model to all groups evidenced a good fit and invariance across sex. Construct validity was shown with the factors of the DSHS and their established counterpart measures across groups (Levenson et al., 1995; Raskin & Hall, 1979), and indicates that the DSHS adequately covers the elements of the personality constructs it seeks to measure. External validity was provided as well as temporal reliability.

The main deviation from existing DT measures is the subsumption of Machiavellianism and psychopathy and we should take some time to unpack this. The theoretical standpoint of the successful psychopathy factor is grounded within Cleckley's (1941), influential account of psychopathy and the primary distinction of the construct (Karpman, 1948), which addresses the core interpersonal and affective personality features. The distinction between primary and secondary psychopathy, is

salient, as individuals who embody these traits, diverge from a dispositional stance, yet they are often conflated within the expansive term of psychopathy. For example, Glenn and Sellbom (2015), posited that Machiavellianism can be described in terms of psychopathy, although the latter term is broad and further incorporates characteristics of impulsivity and risk taking, traits which may lead to incarceration (Mullins-Sweatt et al., 2010).

Contrary to this, Cleckley (1941), affirmed that individuals with psychopathic traits are not confined to institutionalised samples but also operate in the community. He alluded to successful people being those who held a higher social status and were able to maintain a charade of normality, which in turn could elicit financial success (Coid et al., 2012). Relatedly, this has been expanded upon, whereby, the successful psychopath can be conceptualised as an individual who embodies high trait levels and at least one of two approaches; high social status and/or absence of, or limited antisocial behaviour (Persson & Lilienfeld, 2019). The latter authors further theorised greater levels of intelligence as well as high levels of executive functioning and/or low levels of disinhibition, could augment success.

Neuropsychological studies have supported this latter suggestion, whereby successful psychopaths, with a full expression of primary traits, have enhanced executive functioning which can support their deceitful and manipulative characteristics, as well as normal or above normal neurobiological functioning (Gao & Raine, 2010; Ishikawa et al., 2001). Thus, although opinions have maintained that impulsivity is fundamental to most definitions of psychopathy (e.g., Jones & Paulhus, 2014), this has mainly been reflected in neuropsychological studies using incarcerated males (e.g., Blair et al., 2006; Decety et al., 2013). These individuals, considered unsuccessful psychopaths, have neurobiological and psychophysiological deficiencies, which induces diminished executive functioning and precarious decision making (Mahmut et al., 2008).

The underpinning of primary psychopathy in reference to the successful psychopath only provides a partial explanation of the factor. Although justification for the subsumption of Machiavellianism, can be provided to an extent, through past research, whereby the construct has

historically been determined as parallel to primary psychopathy (e.g., McHoskey et al., 1998; Miller, Hyatt, et al., 2017; Rogoza & Cieciuch, 2018; Vize et al., 2018), or that Machiavellianism may be the lower end of the psychopathy spectrum (Carter et al., 2015), this is mainly based on measurement, not theory. Concerningly, Machiavellianism as a construct has been conveyed as not being guided by any theoretical framework, which has been related back to the initial observations made by Christie and Geis (1970), suggesting there were individual differences in Machiavellianism, yet without clarity as to why (Wilson et al., 1996).

The personality traits which define Machiavellianism were mainly motivated by the writings of Machiavelli, a male political advisor in the 1500's, primarily his book 'The Prince'. Deliberations between Christie and his colleagues formulated the ethos of the construct, which was the investigation of the politically oriented individual (Christie & Geis, 1970). Four general characteristics emerged, which centred around a manipulative individual: a lack of empathy which enables the manipulator to view others as objects; an instrumental view of others which facilitates their deceit and manipulation; An instrumental view of others whereby they are seen through a rational lens; A focus on getting things done, rather than long-range goals (Christie & Geis, 1970). Hence, there was no specific theory guiding Machiavellianism, merely interpretations from historical narratives. Yet, this drove the conviction that people diverged in both willingness and ability to manipulate others and provided further confidence, that these differences could be meaningfully measured (Christie & Geis, 1970; McHoskey et al., 1998).

Individuals who scored highly on the Mach IV, indicated an embodiment of greater emotional detachment, opportunism, resistance to social influence, employing manipulation and exploitation within situational contexts to achieve their goals (Christie & Geis, 1970). Even though the argument was made that strategic planning is the key differentiating trait between psychopathy and Machiavellianism (Jones, 2016), research has shown this is a primary psychopathic characteristic (Palmen et al., 2020; Poythress & Hall, 2011). Machiavellianism's strategic planning pertains to the level of manipulation required based on the situational context and the ability to change those levels if required (Christie & Geis, 1970), whilst primary psychopaths can display high levels of planful behaviour, indicating a greater ability for strategising and forethought (Poythress & Hall, 2011). The crux of the matter is that the core characteristics of Machiavellianism are those that are central to primary psychopathy (Cleckley, 1941).

Interestingly, a recent review expressed the question as to whether Machiavellianism was dead or dormant (Jones & Mueller, 2021). Although the authors presented a case to differentiate Machiavellianism from psychopathy, their argument was unconvincing. The narrative draws mainly on the secondary conceptualisation of psychopathy and distinguishes Machiavellianism through impulse control and manifestation of immoral acts through interactions between the individual and the environment. Specifically, immoral acts are enacted when there is maximum benefit and minimal risk to the Machiavellian, conversely to the psychopath who is environmentally insensitive to negative outcomes, unable to adapt their behaviour due to a lack of impulse control. However, impulse control has previously been discussed and the relationship with Machiavellianism and the environment can be aligned with the elaborated version of the moderation-expression model, which addresses structural, environmental and contextual factors, offering a conceptual framework for understanding successful psychopathy (Steinert et al., 2017).

It is therefore unsurprising that theories have evolved whereby Machiavellianism and primary psychopathy reflect the successful psychopath (McHoskey et al., 1998; Sharpe et al., 2021). Intriguingly, Glenn and Sellbom (2015), conclude their paper with a description of the prototypic psychopathic traits; manipulation, deceitfulness, grandiosity, callousness, impulsivity and risk-taking. They then reflect upon a divergent assemblage of traits which still express an interpersonally destructive individual but is incongruent with traditional conceptualisations. This person is intelligent, yet embodies callousness, deceitfulness and manipulation, with low levels of impulsivity and irresponsibility, thus, avoiding detection by legal authorities. In sum, the latter description alludes to the successful psychopath.

Turning to narcissism, for which there were no theoretical anomalies, the DSHS factors have a specific focus on entitlement, represented by grandiose entitlement and entitlement rage. These facets align with the grandiose and vulnerable aspects of the broad narcissism construct and were the characteristics which emerged homogenously across males and females and substantiated across samples. The two DSHS factors also corroborate the literature, which has contended that the phenotypic structure of narcissism is attributed to a core of entitlement which manifests in grandiosity and/or vulnerability (Ackerman et al., 2019; Dinić et al., 2021).

Grandiose entitlement is entwined with an individual who fundamentally believes they embody special privilege. This manifests from a self-image of superiority, resulting in a willingness to exploit others, reflecting a grandiose ego (Ackerman & Donnellan, 2013). Conversely, entitlement rage captures experiences of anger, when the individual feels their expectations are unmet, which reflects a fragile ego, intermeshed with the emotional dysregulation of rage and destructiveness (Bishop & Lane, 2002; Pincus & Lukowitsky, 2010). Entitlement and superiority can be considered the most maladaptive traits of the narcissism construct, traversing both general population and violent incarcerated samples (Bushman et al., 1999). The darkest aspects of narcissism which are socially malicious and interwoven with maladaptive outcomes (Brown et al., 2009; Maxwell et al., 2011), are not constrained by clinical, forensic or general population etiologies but are a shared component of the construct, across males and females.

The DSHS factor which addresses acts of everyday sadism, captures the sadistic cruelty which emerges from yearnings and intentions. These tendencies are articulated through thought, action or speech, which results in the real or virtual suffering of others and is interlinked with the intrinsic pleasure and/or power felt by the perpetrator (Plouffe, Saklofske & Smith, 2017). Yet, sadistic cruelty is not well described by the Big Five constructs (Soto & John, 2017), nor to a lesser extent, the PID-5 (Krueger et al., 2012). In line with previous research (Pineda et al., 2021; Russell et al., 2017), and across both sexes, disagreeableness and antagonism were the key normative and maladaptive personality traits. This reflects the hostile and aggressive nature of individuals who are predisposed to sadistic cruelty (Chester et al., 2019).

Consequently, sadistic cruelty may be better described through personality traits which extend beyond the normative and maladaptive constructs. Research has suggested that both spitefulness and contempt may be a core component, whereby pleasure is obtained through dominance (Garofalo et al., 2019), as well as boredom which can provoke both reactive and proactive aggression (Pfattheicher et al., 2020). Nevertheless, further research is required to provide additional depth as to the personality traits which drive individuals to commit acts of sadistic acts of cruelty.

4.1. Limitations

The present set of studies have some limitations that should be considered.

Strength was found within the sample sizes, mainly equal groups of males and females, as well as students and non-students. This alleviated concerns about generalisability, which cannot be assured when scales are developed using solely student samples (Paulhus et al., 2020). However, a limitation when relying on self-report data may be problematic with socially desirable responding, especially when investigating dark personalities. Yet, this method has been argued as a reliable way to assess these constructs (Jones & Paulhus, 2014), whereby erroneous responding is mainly unproblematic in psychopathy and narcissism research, if there are no incentives to skew responses (Kelsey et al., 2015; Ray et al., 2013; Sleep et al., 2019).

In terms of the measures, using the long forms of the Mach IV (Christie & Geis, 1970) and the Narcissistic Personality Inventory (Raskin & Hall, 1979), is seen as a strength, although their limitations, in relation to their unstable factor structures and reliability, are well documented and acknowledged (Barelds & Dijkstra, 2010; Monaghan et al., 2016). Although other scales have been developed to measure the constructs, e.g., Five-Factor Machiavellianism Inventory (Collison et al., 2018), these do not appear to have been put to widespread use, which can be seen as a limitation of dark personality research. A further limitation, that was reflected in its absence, was the paucity of studies which investigated sex invariance within the dark personality measures. However, this may be a function of researchers not seeing it as being important. Nonetheless, future research may seek to explore the DSHS in relation to gender as well as sex, for further analysis. Finally, although measurement invariance analysis enables researchers to investigate whether a scale holds a similar structure across groups, implying a safeguard against measurement bias, discussions suggest cultural variations should be considered (Collison et al., 2021). Although the studies have provided evidence that the DSHS is invariant across sex, cultural variations were not incorporated.

5. Conclusion

We believe that these studies have served to draw attention as to the importance of analysing samples by sex, using both bottom-up and top-down methods. This synthesis of methods enabled indicators and consequently factors to emerge, which are invariant between males and females. This process culminated in the Dark Side of Humanity Scale (DSHS), a measure which assesses dark personality constructs from an alternative viewpoint. Theoretical implications were found with Machiavellianism and psychopathy, whereby they were subsumed under one construct to form the successful psychopath. Narcissism specifically relates to entitlement, with grandiose entitlement and entitlement rage, representing the grandiose and vulnerable facets of the construct. We found that sadistic cruelty does not significantly deviate from the widely available measures, however, the indicators within the factor are sex invariant. The factors of successful psychopathy and both forms of entitlement provide the DSHS with a shift away from the widely available dark personality measures and with sadistic cruelty, over four studies, we showed that the scale has a psychometrically robust factor structure, which is stable and reproducible. Developing a scale which is sex invariant, provides the foundations for meaningful comparisons, particularly for researchers wishing to explore the dark personality traits across mixed sex samples.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.actpsy.2021.103461.

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