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Measuring malevolence: Quantitative issues surrounding the Dark Triad of personality

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ABSTRACT

Paulhus and Williams (2002) proposed a constellation of malevolent traits referred to as the Dark Triad (subclinical narcissism, subclinical psychopathy, and Machiavellianism). They used the Dark Triad term to raise awareness about the need for researchers across different areas of psychology to include relevant theory and assessments of all three traits when predicting behaviour. However, there still remain misunderstandings, misinformation, and misperceptions about how to disentangle the psychometric and statistical web of interconnected variance associated with these three traits. We outline the statistical approaches that have been proposed (to date) in assessing the Dark Triad and relevant outcomes, and discuss some promising future directions. This paper is intended to inspire discussion and clarification for the nebulous issue of assessing and disentangling overlapping but distinguishable traits, including the Dark Triad of personality.

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There is a relatively new area of research into a concept called the "Dark Triad" which is an individual-difference construct proposed by Paulhus and Williams (2002). There has been an asymptotic rise in papers investigating the utility of these traits (Furnham, Richards, & Paulhus, 2013). Indeed, there are, in this journal many papers currently in press (Black, Woodworth, & Porter, in press; Jonason, Lyons, & Bethell, in press; Pailing, Boon, & Egan, in press; Porter, Bhanwer, Woodworth, & Black, in press.)

Recent papers have found that the Dark Triad traits are differentially informative in predicting workplace behaviours (O'Boyle, Forsyth, Banks, & McDaniel, 2012), aggression (Baughman, Dearing, Giammarco, & Vernon, 2012; Kerig & Stellwagen, 2010), sociosexuality (Jonason & Webster, 2010) and financial misbehaviour (Jones, 2013a). However, the question of proper assessment and statistical approach grows ever pressing. This paper introduces the pros and cons of the established statistical techniques that have been used in previous literature and what directions may be most beneficial.

The issue of statistical overlap began with research by McHoskey, Worzel, and Szyarto (1998) who questioned the utility of many of the malevolent constructs in psychological research. They noticed that the three literatures surrounding the three most popular traits of malevolence (Machiavellianism, Narcissism, and Psychopathy), developed in isolation from one another. For example, the forensic literature has focused almost exclusively on Psychopathy (Patrick, 2006), the applied and clinical literature has focused primarily on Narcissism (Cain, Pincus, & Ansell, 2008; Campbell, Hoffman, Campbell, & Marchisio, 2011; Miller & Campbell, 2008; Pincus & Lukowitsky, 2010), and the social/personality literature (at least prior to 1988) focused primarily on Machiavellianism (Fehr, Samsom, & Paulhus, 1992). McHoskey and colleagues questioned whether these traits were really any different, and argued that it may be useful to begin discussions across areas of psychology.

Paulhus and Williams (2002) suggested that these areas of psychology should examine more than one of these overlapping malevolent traits. They further asserted that these traits were each individually useful, and that researchers should assess all three to determine the primary predictor of a given outcome. This last assertion stemmed from the realization that it is unclear which trait would be related to a given outcome unless all three are assessed. Since the original paper by Paulhus and Williams, additional research has accumulated through behavioural genetics (Vernon, Villani, Vickers, & Harris, 2008), laboratory aggression (Jones & Paulhus, 2010), observational research (Williams,

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Nathanson, & Paulhus, 2010), and meta-analysis (O'Boyle et al., 2012), that these traits are indeed distinguishable and should be assessed simultaneously (Furnham et al., 2013).

Of these three constructs, Machiavellianism is the only one that is not traditionally seen as a clinical syndrome (notably a personality disorder), but rather a "normal" personality trait. The trait is marked by a belief system or personal philosophy that is characterized by cynical, manipulative and amoral behaviour (Christie & Geis, 1970). Machiavellians engage in behaviour that is expedient and self-interested, rather than ethical and principled, tend to be callous (Jones & Paulhus, 2011a) and have a cold and calculating disposition (Jones & Paulhus, 2009). The most common assessment tool for the Machiavellian personality trait is the MACH-IV (Christie & Geis, 1970). Although, it should be noted that recent attempts have been made to develop newer, multi-dimensional assessments (Dahling, Whitaker, & Levy, 2009; Kessler et al., 2010)

Narcissism and Psychopathy are constructs traditionally seen as clinical in nature, though there are measures of both at the subclinical level (Hogan & Hogan, 1997). Although psychiatric classification has traditionally focused on diagnosis and classification, more recent attempts have been made to study these traits at the subclinical level (LeBreton, Binning, & Adorno, 2006). Researchers have generalized findings from clinical to "normal" (Lilienfeld & Andrews, 1996), and business populations (Heinze, Allen, Magai, & Ritzler, 2010).

"Normal" Narcissism is characterized by grandiose sense of self-worth, entitlement, dominance, and superiority. The most common assessment for narcissism in the normal range is the Narcissistic Personality Inventory (NPI) (Raskin & Hall, 1979). Shorter forms of these original items have also recently been validated, such as the NPI-16 (Ames, Rose, Anderson, & Cameron, 2006), and the NPI-13 (Gentile et al., 2013). However, many have argued that they fail to capture more vulnerable or pathological forms of narcissism (Miller et al., 2010; Pincus et al., 2009). Thus, Pincus et al. (2009) developed alternative assessments that assess this pathological and "covert" form (Wink, 1991) of the narcissistic style (Pincus & Lukowitsky, 2010).

Psychopathy has been noted as the most "dangerous" of the three (Paulhus & Williams, 2002), although recent theoretical work has challenged this assertion, arguing that situational circumstances dictate the toxicity of each trait (Jones, 2014). For example, individuals high in prejudiced beliefs may take violent or political roads to oppression and discrimination, both of which are equally harmful (Jones, 2013b). Subclinical psychopathy manifests itself mainly in part by high levels of impulsivity and thrill-seeking behaviours, along with low levels of empathy (Hare, 1985; Lilienfeld & Andrews, 1996). The Self-Report Psychopathy (SRP; Paulhus, Neumann, & Hare, in press) scale has, at its core, the same four-factor solution as the Psychopathy Check List (Hare, 1991), which is the "gold standard" for the measurement of psychopathy (Edens & Cox, 2012; Forth, Brown, Hart, & Hare, 1996).

Other validated assessments for psychopathy also exist in the form of Levenson's Primary and Secondary Psychopathy Scales (LPSP; Levenson, Keihl, & Fitzpatrick, 1995), and the Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996). In fact, a new measure – the Elemental Psychopathy Scale (EPS; Lynam et al., 2011) – also shows much promise in the area of subclinical psychopathic personality assessment. Our focus on the SRP is not to suggest that one assessment may be more accurate in assessing psychopathy than the other. However, given that the vast majority of research on the Dark Triad proper has focused on the SRP, our review focuses primarily on that assessment.

Although there is an extensive literature on co-morbidity in personality disorders, there is little in the way of actual data in clinical populations that assess the co-morbidity of psychopathic and narcissistic disorders. Although former versions of DSM manuals have classified these disorders in the Cluster B (Personality disorders), narcissism has recently been removed from the new DSM-V (Miller, Widiger, & Campbell, 2010). In spite of its removal, research has found that Narcissism (even at the clinical level) is distinguishable from psychopathy (Reise & Wright, 1996; Schoenleber, Sadeh, & Verona, 2011). Although it should be noted that many have argued that there are different types of psychopaths (Murphy & Vess, 2003) and narcissists (Wink, 1991), which may preclude their ability to differentiate between subtypes of these traits.

The most convincing literature on the relationship of these two disorders lies in two types of data. First, factor analytic studies where both disorders load similarly highly on the same factor (Furnham & Crump, 2005; Furnham & Trickey, 2011; Hogan & Hogan, 1997). Second, correlation studies that show both Psychopath and Narcissistic traits have similar correlates with many other self-, other-report, and behavioural measures (Khoo & Burch, 2008; Moscoso & Salgado, 2004).

1. Big Five personality traits

At the core of the Dark Triad of personality is a negative relation to the Big Five personality trait: Agreeableness (Paulhus & Williams, 2002; Lee & Ashton, 2005; Jakobwitz & Egan, 2006; Nathanson, Paulhus, & Williams, 2006a; Nathanson, Paulhus, & Williams, 2006b; Miller et al., 2010; Jonason, Li, & Teicher, 2010; Jonason & Webster, 2010; Williams et al., 2010). Individuals that are Agreeable in nature are interested in social harmony while those that are disagreeable manifest characteristics that are antisocial, which is how this personality trait relates the Dark Triad constructs. All of these sub-facets of Agreeableness (Trust, Straightforwardness, Altruism, Compliance, Modesty, Tender-Mindedness) have been shown to have negative relations to Antisocial Personality Disorder and Narcissism at the clinical level (Widiger, Trull, Clarkin, Sanderson, & Costa, 2002). Those scoring low on Agreeableness are described as demanding, clever, flirtatious, charming, shrewd, autocratic; selfish; stubborn, headstrong, impatient, intolerant, outspoken, hard-hearted; clever, assertive, argumentative, self-confident, aggressive, idealistic; and unstable (Costa & McCrae, 1992).

When considering the sub-facets of Agreeableness – trust, straightforwardness, altruism, compliance, modesty and tender-mindedness – and their relationship to Antisocial personality disorder and Narcissism, two factors emerge as having low scores for both. These defining features are altruism and tender-mindedness. Those that score low on the altruism subscale are somewhat more self-centred and reluctant to get involved in the problems of others while those that score low on the tender-mindedness subscale are more hard-headed and less moved by appeals to pity and consider themselves realists who make rational decisions based on cold logic (Furnham, 2008).

Table 1 shows nearly 100 correlations between the three scales measuring the Dark Triad including one study with behaviour genetics results (Vernon et al., 2008). It should be pointed out that researchers in the different studies are not always using the same measures and in some studies subscale scores are also used. Three things are noticeable from these results. First, nearly all correlations are positive and significant. Second, nearly a quarter are $r > .50$. Third, overall the highest correlations appear to be between the measure of Psychopathology and Machiavellianism, and the lowest between Narcissism and Machiavellianism. It is unclear to what extend these correlations are a function of the psychometric properties of the measures, item overlap, dissimulation, or other factors.

Most researchers in individual differences feel obliged to describe their measures in Big Five Factor space. Table 2 shows the

Table 1
Intercorrelations among Dark Triad measures across available publications.

	N	r N/M	r N/P	r M/P	Mean r
Stand Alone Measures (Student)					
Chabrol et al. (2009)	615	.27	.32	.29	.29
Gordon and Platek (2009)	24	.31	.25	.67	.41
Hodson, Hogg, and MacInnis (2009)	197	.27	.49	.62	.46
Jakobwitz and Egan (2006) (primary psychopathy)	82	.36	.40	.70	.48
Jonason et al. (2009)	244	.20	.39	.28	.29
Jonason and Kavanagh (2010)	325	.10	.44	.22	.25
Jonason, Koenig, and Tost (2010) (Study 2)	221	.13	.34	.42	.30
Jones and Figueredo (2013) (Study 1)	397	.22	.46	.53	.40
Jones and Paulhus (2010)	82	.17	.48	.41	.35
Jones and Paulhus (2011b) (Study 1)	142	.14	.32	.49	.32
Lee and Ashton (2005)	164	.17	.37	.66	.40
Nathanson et al. (2006a) (Study 1)	291	.25	.46	.58	.43
Nathanson et al. (2006a) (Study 2)	150	.23	.52	.50	.42
Nathanson et al. (2006b)	279	.27	.40	.46	.38
Paulhus and Williams (2002)	245	.25	.50	.31	.35
Harms, Williams, and Paulhus (2001)	244	.26	.50	.30	.35
Rauthmann, (2012)	408	.40	.54	.36	.43
Rauthmann and Kolar (2013)	201	46	.21	.56	.41
Williams et al. (2010) (Study 1)	228	.26	.44	.53	.41
Williams et al. (2010) (Study 2)	107	.23	.33	.49	.35
Williams, Nathanson, and Paulhus (2003)	274	–	.46	.58	–
Williams and Paulhus (2004)	289	–	.60	.34	–
Williams, Paulhus, and Hare (2007)	274	–	.46	.48	–
Mean correlations		.25	.42	.50	–
Stand Alone Measures (Non-Student)					
Campbell et al. (2009)	472	.18	.31	.55	.35
Jones (2013a) (Study 1)	119	.35	.45	.61	.47
Jones (2013a) (Study 2)	109	.30	.50	.67	.49
Jones (2013b) (Study 1)	164	.37	.46	.68	.50
Jones (2013b) (Study 2)	89	.58	.58	.66	.61
Jones (in press)	157	.38	.47	.70	.52
Jones and Figueredo (2013) (Study 2)	388	.48	.52	.66	.55
Jones and Olderbak (2014) (Study 1)	261	.27	.32	.56	.38
Jones and Paulhus (2011b)	379	.18	.27	.50	.32
Jones and Paulhus (2011b) (Study 2)	329	.32	.48	.62	.47
Jones and Weiser (2014)	884	.32	.48	.57	.46
Vernon et al. (2008)	278	.12	.28	.51	.27
Mean correlations		.24	.43	.61	–
Short Dark Triad (SD3)(Student)					
Jones and Olderbak (2014) (Study 2)	186	.30	.47	.46	.41
Jones and Paulhus (in press) (Study 1)	489	.18	.34	.50	.34
Jones and Paulhus (in press) (Study 2)	279	.22	.31	.40	.31
Jones and Paulhus (in press) (Study 3)	230	.29	.42	.47	.39
Mean correlations		.25	.39	.46	
Dirty Dozen (DD) (Student)					
Jonason, Slomski, and Partyka (2012)	419	.57	.32	.56	.48
Crysel, Croiser, and Webster (2013) (Study 1)	1097	.54	.31	.52	.47
Jonason et al. (2010) (Study 1)	246	.60	.34	.51	.48
Crysel, Croiser, and Webster (2013) (Study 2)	307	.51	.35	.60	.49
Mean correlations		.56	.36	.55	–

Note: M = Machiavellianism, N = Narcissism, P = Psychopathy.

studies that relate the three measures to the Big Five. Neuroticism, seems weakly (negatively) related to the Dark Triad. Next, the correlations are rather different for the three measures: Extraversion is most consistently the trait most highly correlated with Narcissism, whereas for Machiavellianism, it is most often low Agreeableness along with low Conscientiousness. The correlations for Psychopathy also implicate Disagreeableness as the major Big Five correlate but also low Conscientiousness.

To dismiss the Dark Triad as simply low Agreeableness is not warranted, though it is clear why the correlations are highest for that trait. A Dark Triad person seems to be predominantly a Disagreeable, low Conscientious, Stable, Extravert. This makes sense from the work by Widiger, Costa, & McCrae (2002), who plotted the Big Five facet scores against the personality disorders. Thus, they noted five of the six Agreeableness facets and three of the six Conscientiousness facets were associated with Psychopathy.

Narcissism was more complicated: the suggested four of the Neuroticism, one Extraversion, and two Conscientious dimensions related to Narcissistic Personality Disorder. Neither was at all related to Openness facets.

It seems that understanding the place of the Dark Triad in the Big Five in factor space would really beneficial. It would also ideally mean a large sample completing more than one of each of the Dark Triad measures as well as using the long version NEO-PI-R with the facet scores. However it should be pointed out that there are various alternatives to the Big Five framework including three and six factor models which may also be beneficially related to the Dark Side measures. One is the HEXACO model which includes the Honesty/Humility factor. Indeed, Jonason and McCain (2012) demonstrated that that the Honesty/Humility factors was more strongly correlated with the Dirty Dozen subscales than Agreeableness. Equally the Dark Side scores may be strongly related to other single

Table 2
Big Five and Dark Triad correlations.

Study	Big Five Trait	Narcissism	Machiavellianism	Psychopathy
Jakobwitz and Egan (2006)				
(n = 82)	Extraversion	.10	−.13	.08
	Agreeableness	−.43	−.41	−.43
	Conscientiousness	−.24	−.27	−.21
	Neuroticism	−.10	.38	.30
	Openness	.10	−.17	−.21
Jonason et al. (2010)	Extraversion	.37	.04	.17
	Agreeableness	−.17	−.15	−.18
	Conscientiousness	.01	−.22	−.14
	Neuroticism	−.15	.10	−.02
	Openness	.23	.00	.21
Jonason and Webster (2010)				
Study 1 (n = 273)	Extraversion	.15	.07	−.07
	Agreeableness	−.17	−.35	−.45
	Conscientiousness	−.17	−.25	−.19
	Neuroticism	−.10	−.03	−.07
	Openness	.15	−.03	.03
Jonason and Webster (2010)				
Study 2 (n = 246)	Extraversion	.10	.18	.10
	Agreeableness	−.17	−.24	−.35
	Conscientiousness	−.14	−.20	−.18
	Neuroticism	−.14	−.11	−.17
	Openness	.06	.04	.05
Lee and Ashton (2005)				
(n = 164)	Extraversion	.49	−.07	−.06
	Agreeableness	−.10	−.16	−.15
	Conscientiousness	−.03	−.27	−.18
	Neuroticism	−.14	−.23	−.29
	Openness	.10	−.20	−.19
Lee et al. (2013)				
Study 1 (n = 232)	Extraversion	.41	−.27	−.04
	Agreeableness	−.20	−.48	−.46
	Conscientiousness	−.10	−.29	−.36
	Neuroticism	−.09	−.12	−.35
	Openness	−.02	−.34	−.23
Lee et al. (2013)				
Study 2 (n = 200)	Extraversion	.07	−.10	−.20
	Agreeableness	−.37	−.44	−.43
	Conscientiousness	−.07	−.28	−.23
	Neuroticism	−.09	−.01	−.13
	Openness	−.11	−.15	−.17
Miller et al. (2010)				
(n = 361)	Extraversion	.33	–	−.21
	Agreeableness	−.49	–	−.71
	Conscientiousness	.15	–	−.17
	Neuroticism	−.30	–	−.06
	Openness	.03	–	−.12
Nathanson et al. (2006a)				
(n = 279)	Extraversion	.45	−.08	.18
	Agreeableness	−.09	−.40	−.42
	Conscientiousness	.08	−.25	−.40
	Neuroticism	−.21	.06	−.11
	Openness	.27	−.08	.09
Nathanson et al. (2006b)				
(n = 291)	Extraversion	.37	−.15	.05
	Agreeableness	−.24	−.57	−.46
	Conscientiousness	.08	−.32	−.23
	Neuroticism	.23	−.14	.05
	Openness	.10	−.06	.05
Paulhus and Williams (2002)				
(n = 245)	Extraversion	.42	−.05	.34
	Agreeableness	−.36	−.47	−.25
	Conscientiousness	−.06	−.34	−.24
	Neuroticism	.02	.12	−.34
	Openness	.38	−.03	.24
Vernon et al. (2008)				
(n = 278)	Extraversion	.36	−.06	.05
	Agreeableness	−.37	−.49	−.59
	Conscientiousness	−.03	−.32	−.37
	Neuroticism	−.15	.23	.13
	Openness	.30	.06	.01
Williams et al. (2010)				
Study 2 (n = 228)	Extraversion	.48	−.09	.18
	Agreeableness	−.29	−.50	−.48

Table 2 (*continued*)

Study	Big Five Trait	Narcissism	Machiavellianism	Psychopathy
	Conscientiousness	.12	−.36	−.33
	Neuroticism	.24	−.09	.19
	Openness	.23	−.01	.08
Williams et al. (2010)				
Study 2 (*n* = 107)	Extraversion	.36	−.10	.03
	Agreeableness	−.21	−.45	−.58
	Conscientiousness	−.06	−.30	−.39
	Neuroticism	.19	−.08	.03
	Openness	.17	−.13	−.04

traits like Emotional Intelligence (Furnham, 2008) that merit investigation

What is required is evidence of both convergence, and perhaps more discriminant validity of the Dark Triad compared to standard "normal" models of personality functioning. That is, a central question for Dark Triad researchers is also the issue of incremental variance of any measures over and above Big Five or select trait measures

2. Statistical issues with overlapping constructs Measurement

In the literature pertaining exclusively to the Dark Triad, a substantial number of assessments have been used to measure the constructs individually and/or collectively (see Table 1 for a comprehensive list of the measures used in individual studies). Given the length of these primary measures, inclusion of all three has proven difficult in the research literature. As a consequence, recent attempts have been made to create shorter inventories of the three Dark Triad traits. The first inventory to be published, *The Dirty Dozen*, aims to assess each trait using four items (Jonason & Webster, 2010). To some extent this measure presents contradictory patterns with the original Dark Triad assessments (Jonason & Tost, 2010), and has been criticized for poor validity (Miller et al., 2012), and poor predictive power (Lee et al., 2013), in spite of its sound psychometric properties (Webster & Jonason, 2013). However, there are authors who continue to argue for its validity (Jonason & Luevano, 2013).

A second alternative, the *Short Dark Triad* (SD3; Jones & Paulhus, in press) claims to assess the Dark Triad using nine items per trait. The SD3 does have strong correlations with the original measures (Jones & Paulhus, in press) and has good predictive validity in behavioural paradigms (Ashton-James & Levordashka, 2013), although additional research is needed on this measure. However, preliminary investigations comparing the *Dirty Dozen* and the *Short Dark Triad* recommend the Short Dark Triad or SD3 (Lee et al., 2013; Maples, Lamkin, & Miller, in press).

3. Analytical strategy

A central question at the heart of this literature stems from Paulhus and Williams's seminal paper in 2002: that is, whether there is sufficient evidence to combine Dark Triad scores. Psychiatry, as well as clinical and differential psychology has long struggled with overlapping variance with respect to trait differentiation and assessment (Brown & Barlow, 1992; Widiger & Trull, 2007). One question of relevance to this issue is the evidence of co-morbidity in the two personality disorders. The Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV) reports the prevalence rates of personality disorders in the general population (general community), in forensic settings (jails or prisons) and also in clinical setting. Specifically for Antisocial Personality Disorder (APD) and Narcissistic Personality Disorder (NPD) the community

sample prevalence rates are about 3% for males and 1% for females, and less than 1%, respectively. The DSM-IV also states that APD and NPD can be confused as they "share a tendency to be tough-minded, glib, superficial, exploitative, and unempathetic" (p. 649). Given the recent revision of the DSM-V (American Psychiatric Association, 2013), it is unclear how new definitions of APD will alter prevalence rates. Moreover, given the removal of NPD in the DSM-V, the issue of overlap in clinical populations may go unaddressed entirely. Notwithstanding, according to DSM-IV conceptualizations, these traits can be distinguished from one another based on key criteria: APD is partially characterized by impulsivity, aggression and deceit while NPD is differentiated through its characteristic grandiosity. However, many researchers insist that grandiosity is part of the concept of Psychopathy (Harpur, Hare, & Hakstian, 1989), and many have argued that impulsivity is part of the narcissistic personality (Schoenleber et al., 2011; Vazire & Funder, 2006). Thus, further work is needed to continue to disentangle these two types of personality disorders, which will be challenging given the removal of NPD from the DSM-V.

4. Previous statistical approaches to the Dark Triad

Often, constructs such as the Dark Triad have an identifiable common core (eneuroticism, anxiety, externalizing behaviours), leading to misperceptions, misdiagnosis, and misunderstandings in the literature. Researchers have been categorised as "splitters" vs. "lumpers", with the former trying to make distinctions between concepts and split them into ever finer, albeit related, categories while the latter attempt to combine them to achieve parsimony. Given the struggles inherent in the Dark Triad of personality approach, there have been numerous attempts to reconcile the appropriate statistical approach to assessing the impact that these traits have on a given outcome. Here we review the previous findings and suggest an exciting new alternative.

Recent research by Jones and Figueredo (2013) has found that the combination of callousness and manipulation accounts for the entirety of the overlap among the Dark Triad traits. The residual components of each construct are unrelated when this common core is removed. As a consequence, it seems clear that callous-manipulation constitutes the overlapping component of these traits. They concluded that because the core is related to all traits that have a malevolent flavour, callous-manipulation would be universally related to harmful outcomes that would be predicted by all three traits of the Dark Triad. Researchers who investigate questions related to the Dark Triad of personality have attempted to use various statistical approaches to address the issue of overlap among the traits.

Starting with Paulhus and Williams (2002), the recommended approach was to control for the overlap among the three traits by entering them into a simultaneous regression. Although this procedure provides a clear picture of which construct is most likely related to a given outcome, it has limitations. First, as regression

tends to do, the shared variance or overlap gets lost when calculating effect sizes in OLS regression (Cohen, Cohen, West, & Aiken, 2003). Second, regression may suggest a trait is unrelated to an outcome given its shared association with a trait that is *more* related to that given outcome. Thus, regression is limiting in that it may *underestimate* the associations that *parts* of certain constructs have with certain outcomes. In the example of the Dark Triad, all three traits are high in callous-manipulation (Jones & Figueredo, 2013), as such, although psychopathy may be the *most* related to a given outcome, a regression may imply that the callous-manipulation inherent to Machiavellian has no predictive power.

Another approach utilized in the Dark Triad literature is to combine the traits into a single composite (Jonason, Li, Webster, & Schmitt, 2009). Jonason and colleagues have used this strategy as an attempt to capture the most predictive power (Jonason, Valentine, Li, & Harbeson, 2011). There are some possible limitations of this approach. First, the Confirmatory Factor Analysis (CFA) evidence put forth to support the claim for combination was conducted incorrectly. The authors found that entering the three correlated means of the Dark Triad scales resulted in a single factor. The authors thus declared that a single factor meant the traits could be combined (Jonason et al., 2009). However, the single factor was the result of exhausting the degrees of freedom in a 3 trait variance/covariance matrix, which by definition would result in a one factor extraction (Brown, 2006). This procedure continues to be replicated by other researchers (Carter, Campbell, & Muncer, 2014; Gordon & Platek, 2009; Holtzman, 2011; Jonason, Jones, & Lyons, 2013). Second, the composite approach almost always fails to capture as much variance as a single construct alone (psychopathy), which implies the other traits are not contributing equal variance (Jonason, Li, & Buss, 2010). Third, the fundamental premise that the traits can be combined is in direct contradiction with the definition of the traits. Machiavellianism is a trait that is defined by a strategic malevolence (Jones & Paulus, 2009, 2011a), intact impulse control (Jones & Paulhus, 2011b), and intact executive functioning (Jones, in press). By contrast, Psychopathy is a trait defined by erratic behaviour (Cleckley, 1976); a lack of impulse control (Hare, 1993), and impoverished executive functioning (Newman, 1987). As a consequence, one cannot simultaneously have impulse control and lack impulse control (cf. Jones & Figueredo, 2013). Therefore, the idea of someone being "all three" of the Dark Triad is a theoretical impossibility. It should be noted, however, that Jonason and colleagues do often report both composite and individual Dark Triad scores (e.g., Jonason et al., 2013).

Researchers have more recently turned to Structural Equations Modeling (SEM) to resolve the debate of combination or separation of the Dark Triad traits (Jonason, Kavanagh, Webster, & Fitzgerald, 2011; Jones & Olderbak, in press; Sisco, Gladden, & Figueredo, 2010). Jonason et al. (2011) argued that level of assessment should dictate whether the traits should be combined or separated. Sisco et al. (2010) have also argued that the traits that make up the Dark Triad are indistinguishable at certain stages of assessment. However, SEM approaches to the Dark Triad statistical approach are also flawed. Although SEM allows shared variance to be assessed and utilized (unlike OLS regression), spurious relationships among lower level variables can lead to statistical illusions that higher order factors exist, when in fact, no such shared variance actually does (Ashton, Lee, Goldberg, & de Vries, 2009). As such, SEM suffers from the limitation that there may be an overestimation of shared variance among the Dark Triad traits.

Given the issues surrounding specific trait variance and definitions, Harms, Jones, and Brummel (2013) have worked on mini-markers of malevolence to try and get at more elemental and rudimentary variance associated with characteristics leading to interpersonal harm (Harms et al., 2013). Harms et al. (2013) argued that these malevolent markers should be assessed at elemental levels and recombined in order to avoid making dubious assumptions about what characteristics may or may not be included in trait definitions. Although this approach has been the most promising to date, it fails to explain clusters of patterns observed in certain individuals. For example, the fact that callousness and manipulation are so highly correlated and run through all traits associated with interpersonal harm (Jones & Figueredo, 2013). In this sense clusters of patterns in individual remain to be explained.

One new approach to overlapping assessment, which is rooted in mathematical Set Theory, holds the most promise (Rangel, Morera, & Jones, 2014) thus far. Set Theory is the underlying language in mathematics which has helped unify many areas of the science to basic logical foundations. Smith, Eggen, and Andre (2001) state that the formation of a theory is done by the collection of information and observations. The process of verifying such observations is done through the use of truth tables. Using Set Theory Rangel et al. (2014) have divided the Dark Triad into three family sets (Machiavellianism = M (set), Narcissism = N (set) and Psychopathy = P (set)). Therefore, by using the definitions of Unions and Intersections (As defined in Smith et al. (2001) and the empirical evidence supporting the existence of two common core characteristics (Callousness = C_1 (set), Manipulation = C_2 (set) (Jones & Figueredo, 2013). It is theorized that when analysing the M, N and P sets while only taking into consideration the common core characteristics there should be no way of differentiating between individuals high in Psychopathy, Narcissism, or Machiavellianism (Jones & Figueredo, 2013). By, procuring results as such definition (or E1) would be expressed. Likewise, when analysing all other sets that could be related to the personality traits that make up the Dark Triad such as C_4, C_5,...,C_n there should be a collection of unique C_i sets related to each set M, N and P separately that adhere to definition E1 when controlling for sets C_1, C_2 and C_3.

Hence, Rangel et al. (2014) theorise that the existence of an individual within the Dark Triad to be dependent on the existence of sets C_1, C_2 and C_3 as represented in Table 1, line 1. This line in Table 3 is the solution to the overlapping constructs issue found in statistical approaches to construct validation. Therefore, if any of the participants in the experiment answer in the affirmative to any of the combinations of lines 2 through 7 then they are not considered to exist within the Dark Triad. If it is the case that they do exist within the Dark Triad, then this would serve as a starting point to reformulate the theory.

Table 3
Truth table of common core characteristics.

#	C_1	C_2	C_3	C1^C2	Has dark personality = $\cup_{i=1}^{2} C_i$	C1^C2^C3	Is Narcissistic = $\cap_{i=1}^{3} C_i$
1	T	T	T	T	T	T	T
2	F	T	T	F	F	F	F
3	T	F	T	F	F	F	F
4	F	F	T	F	F	F	F
5	T	T	F	T	T	F	F
6	F	T	F	F	F	F	F
7	T	F	F	F	F	F	F
8	F	F	F	F	F	F	F

5. Summary and future directions

The Dark Triad concept and measures has attracted an ever-growing set of studies that continue to explain much about overlapping malevolence in the human condition. It is critical to understand and build on ways that these traits overlap and are distinguishable in order to conduct proper analyses (and where appropriate) diagnoses. It is also critical to know where the boundaries and definitions of these traits lie, as other malevolent personalities become emphasised such as sadism (Buckels, Jones, & Paulhus, 2013; Chabrol, Leeuwen, Rodgers, & Sejourne, 2009) and social dominance (Sidanius et al., 2013). Both of these traits have shown the callous-manipulative core that seems to be the hallmark of malevolent personality.

There are shorter assessments available that may prove promising in helping researchers include all three traits in given programs of research without excessive response burden, but these measures need to be compared head-to-head before a definitive statement can be made about their utility. The two measures most notable are the *Dirty Dozen* (Jonason & Webster, 2010) and the *Short Dark Triad* (Jones & Paulhus, in press).

Overall, it appears that standard regression approaches are limited in that they discard critical variance when predicting given outcomes. Similarly Dark Triad composite scores mask unique variance. Structural Equations Model approaches, although an improvement on the previous two approaches, are limited because of the influence that spurious associations have on higher order factors (Ashton et al., 2009). Finally, Set Theory approaches to data analysis prove promising, but have yet to be fully fleshed out and applied to psychometric approaches in personality.

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