Dark Triad Traits, Learning Styles, and Symptoms of Depression: Assessing the Contribution of Mental Toughness Longitudinally

Abstract

Using a semi-longitudinal design, this study explored the degree to which Dark Triad traits predict learning styles (deep, strategic and surface learning) and depression symptoms indirectly, through their association with mental toughness. First year undergraduates (N = 100 matched up at both time intervals; 17 males, 83 females; *mean age* = 19.02, range = 18 to 24) completed self-report questionnaires at the beginning of the academic year and the start of the second term. Narcissism contributed indirectly to reduced surface learning, increased strategic learning, and lower symptoms of depression. Psychopathy and Machiavellianism did not associate with learning styles or depression symptoms through mental toughness. These findings have applied implications suggesting that some aspects of narcissism may be beneficial for mental health and education outcomes. The results also highlight the need for further research to identify ways to promote the adaptive vs. the maladaptive side of dark traits in education.

Keywords: Dark Triad; narcissism; learning styles; mental toughness; depression symptoms

1.0 Introduction

The Dark Triad is a subclinical personality cluster that comprises Machiavellianism, psychopathy and narcissism (Paulhus & Williams, 2002). Machiavellianism is synonymous with manipulation. Individuals scoring high on Machiavellianism employ self-serving strategies, and are master manipulators and deceivers who care little for moral and societal norms (Kapoor, 2015). The construct of subclinical or 'normal' narcissism includes facets retained from the clinical syndrome: grandiosity, entitlement, dominance, and superiority (Paulhus & Williams, 2002). Subclinical psychopathy is characterised by high impulsivity and thrill seeking along with low empathy (Paulhus & Williams, 2002). Although research on the structure and correlates of the Dark Triad has increased exponentially (Muris, Merckelbach, Otgaar, & Meijer, 2017), work on the relevance of these traits for education is limited (Papageorgiou et al., 2018). This is the case, even though overall interest in the role of personality in explaining variation in educationally relevant traits and outcomes has grown (e.g., Dumfart & Neubauer, 2016).

Most studies from the limited literature on the Dark Triad traits in education have explored the influence of these traits on educational performance, indirectly, by exploring their association with variables that may impact outcomes in education. Example outcomes include academic entitlement (Turnipseed, & Cohen, 2015), behavioural difficulties (Papageorgiou et al., 2020), exam copying and plagiarism (Furnham, Richards, & Paulhus, 2013). Narcissism is the only Dark Triad trait that has been explored in relation to educational performance (i.e., school achievement) and for this reason the current review of literature will focus more on narcissism in comparison with Machiavellianism and psychopathy.

1.1 Dark Triad in Education

Turnipseed and Cohen (2015) found narcissistic students were predisposed to academic entitlement. Academic entitlement leads to incivility ranging from negotiating higher grades,

threatening and demanding, to major confrontations (Twenge & Campbell, 2009). Psychological entitlement specifically predicts students' aggressive responses to negative feedback on academic work (Campbell, Bonacci, Shelton, Exline, & Bushman, 2004). Narcissistic individuals may become aggressive in response to threats to self-esteem (Martinez, Zeichner, Reidy, & MiIler, 2008), such as receiving low grades. The link between narcissism and academic incivility was shown in another study, which reported that narcissism and Machiavellianism (but not psychopathy) predicted both perceptions that academic incivilities were appropriate and the frequency of observations of incivilities (Turnipseed, & Landay, 2018).

However, these results should be interpreted with some caution considering that narcissism (just like psychopathy and Machiavellianism) is a multifaceted construct (Miller et al., 2011) that is shown to associate with positive or negative outcomes depending on the facet that is being assessed in a particular study (e.g., Papageorgiou et al., 2019a; Truhan, Wilson, Mottus, & Papageorgiou, 2020). For example, Papageorgiou et al. (2018) assessed grandiose narcissism and mental toughness twice, at the beginning and the end of a school year, in a sample of Italian adolescents. The researchers also asked participants to report their grades at the end of the year. Results indicated that grandiose narcissism assessed at the beginning of the year increased students' mental toughness at the end of the year, contributing indirectly (but not directly) to higher school grades. These results indicate that narcissism may contribute indirectly to school performance through increasing resilience. However, this study did not directly assess students' levels of psychopathology (such as symptoms of depression) or other mediating variables (e.g., learning styles) to understand more effectively the ways narcissism may increase school achievement.

More recently, a study that utilized a large sample of gifted adolescents revealed that, although the Dark Triad traits do not predict exam performance at school, they explain

variation in behavioural problems over and above the variance explained by the Big Five (Papageorgiou et al., 2020). Specifically, narcissism correlated negatively with behavioural difficulties but did not significantly correlate with school grades. At the same time, school grades correlated negatively with behavioural difficulties. Narcissism correlated positively with Extraversion and Openness to experience, prosocial behaviour and Conscientiousness, as well as with the other two Dark Traits; and negatively with Neuroticism and internalizing problems (Papageorgiou et al., 2020). Machiavellianism and subclinical psychopathy exhibited a different pattern of positive correlations mainly with externalizing behavioural problems, and negative correlations with Conscientiousness and Agreeableness. As such, the Dark Triad traits may contribute positively or negatively to educational performance through their role as resilience or risk factors for psychopathology (Papageorgiou et al., 2020). Psychopathology is an established risk factor for underperformance in education (Hengartner, 2015; Tosevski, Milovancevic, & Gajic, 2010).

Another pathway through which dark traits may influence learning and educational performance is through the different strategies that are utilised by individuals scoring high on one or more of these traits. For example, a study found that while psychopathy was the only independent predictor of exam copying (Nathanson et al., 2006a), essay plagiarism was also predicted by Machiavellianism (Williams, Nathanson, & Paulhus, 2010). This pattern of results suggests that students scoring high on psychopathy may choose quick, spur-of-the-moment, strategies to increase performance as opposed to Machiavellians, who may devote significant effort planning how to increase their scores. Whilst, evidence suggests that individual learning orientation relates to personality (Busato, Prins, Elshout, & Hamaker, 1998/2000) and preferred studying style (Ramsden, 1992), there are currently no studies that have explored direct and mediated associations between the Dark Triad traits and learning styles.

The 'learning styles' are preferred methods of learning adopted by students in attaining, analysing and interpreting their knowledge (Kharb, Samanta, Jindal, & Singh, 2013). A deeper approach to learning focuses on subject matter, relates ideas to experiences, and adopts a critical approach (Duff, Boyle, Dunleavy, & Ferguson, 2004). In the strategic approach, students aim to achieve the highest scores possible. This involves good time management and study organization. Hence, they pay more attention to the content as well as assessment requirements (Entwistle, Tait, & McCune, 2000). In a surface approach, learning of the students is restricted to routine memorisation as their intention is merely to complete the task (Entwistle et al., 2000). Based on the aforementioned evidence, one would expect that individuals scoring high on psychopathy would be characterized by a surface approach to learning. Machiavellians would choose a strategic approach placing emphasis on organization and study skills to achieve the highest grades (Duff, et al., 2004). Narcissism did not associate with cheating or plagiarism in the aforementioned studies. However, the literature so far suggests that narcissism's role for educational outcomes may be both important and complex (see Papageorgiou et al., 2020), and that at least some aspects of narcissism (e.g., grandiose narcissism) may be linked with a deeper approach to learning.

In addition, research demonstrates that grandiose narcissism is associated with strategic behaviour in terms of goal pursuit, and narcissists make strategic choices that enable them to 'shine' in comparison with others (Schyns, Wisse, & Sanders, 2019). In terms of learning styles, this focus on superiority and goals may translate to a greater adoption of strategic learning, which reflects a focus on achieving the highest possible grades. The potential links of narcissism with deep and strategic learning are mainly due to grandiose narcissism's positive association with mental toughness, a trait that among other key elements for success involves high levels of goal orientation, confidence in one's abilities and control of emotions (Lin, Clough, Welch, & Papageorgiou, 2017).

1.2 Types of narcissism, Mental Toughness and depressive symptoms

Subclinical narcissism includes facets retained from the clinical syndrome, namely grandiosity, entitlement, dominance, and superiority (Paulhus & Williams, 2002). Two main types exist: grandiose and vulnerable narcissism (Miller et al., 2011). Exhibitionism, lack of humility/modesty, and interpersonal dominance characterize grandiose narcissism, whereas negative affect, distrust, selfishness, and a need for attention and recognition are key features of vulnerable narcissism (Dickinson & Pincus, 2003). The common core of grandiose and vulnerable narcissism appears to be interpersonal antagonism or (low) agreeableness (Miller, Lynam, Siedor, Crowe, & Campbell, 2018). Research suggests that grandiose narcissism associates mainly with positive outcomes, while vulnerable narcissism predicts mainly negative outcomes (Besser & Zeigler-Hill, 2011). Indeed, grandiose narcissism may increase mental toughness. Specifically, one's ability to keep emotions under control, to commit long-term to a target, to be confident in his or her abilities and to cope and perform under stress (Lin, Mutz, Clough, & Papageorgiou, 2017; Papageorgiou, Wong, & Clough, 2017; Sabouri, Gerber, Bahmani et al., 2016). Furthermore, Sabouri, Gerber, Lemola, et al. (2016) revealed that grandiose narcissism correlated positively with physical activity and sleep patterns, and negatively with anxiety traits.

The positive association between grandiose narcissism and mental toughness additionally links with beneficial psychopathology (e.g., Papageorgiou et al., 2019c) and education outcomes (Papageorgiou et al., 2018). For example, in a series of studies Papageorgiou, Denovan and Dagnall (2019b) revealed that grandiose narcissism associated indirectly with fewer symptoms of depression in the general population, through its positive relationship with mental toughness. Exploring resilience factors against depression is critical especially in samples of university students. This is because university students experience rates of depression that are substantially higher than those found in the general population,

which ultimately affects their well-being and educational performance (Ibrahim, Kelly, Adams, & Glazebrook, 2013).

Taken together, these findings suggest that grandiose narcissism may have positive indirect links to educational outcomes and lower symptoms of psychopathology through its relationship with mental toughness.

1.3 The current study

The aforementioned literature suggests that individual differences in the Dark Triad traits have implications for learning and educational performance. However, this topic is severely understudied when compared to research in the Dark Triad outside education, or to research assessing other personality traits (e.g., the Big Five) in education. The evidence further suggests that dark traits may play an important role relative to educationally relevant outcomes, not directly, but through their role as resilience factors against psychopathology; or through influencing an individual's learning strategies. Finally, while dark traits come together to form the Dark Triad of personality, it is clear from the existing evidence that they exhibit diverse patterns of correlations with outcomes in the sphere of psychopathology and education. As such, longitudinal models that test concurrently direct and indirect (through other personality concepts) associations between the dark traits and learning can be informative in shedding light on the degree to which these traits influence education outcomes. As such, the present study addresses the following question: Do dark personality traits predict learning styles (deep, strategic and surface learning) and depression symptoms indirectly, through their association with mental toughness?

In this study, assessment of all Dark Triad traits occurred to explore the different learning strategies that individuals who score high on each of these traits, adopt in Higher Education. Furthermore, the authors considered the mediating effects of mental toughness on the association between the Dark Triad, learning styles and symptoms of depression. This is

because mediation models have shown that mental toughness is relevant for education outcomes and psychopathology linking for example narcissism to higher grades (Papageorgiou et al., 2018) and lower scores on symptoms of depression (Papageorgiou et al., 2019).

Based on previous findings (see Papageorgiou et al., 2018) derived from longitudinal studies, the authors anticipated that mental toughness at T2 will be predicted positively by narcissism assessed at T1; and negatively by psychopathy and Machiavellianism assessed at T1. This change in levels of mental toughness will then mediate the relationship between the Dark Triad, learning styles and symptoms of depression. Specifically, the authors tested two hypotheses over time (i.e., time 1 to time 2). Firstly, grandiose narcissism would predict, indirectly (through mental toughness), lower depression, a deeper and more strategic learning style and less surface learning. Secondly, psychopathy and Machiavellianism would predict, indirectly (through mental toughness), higher depression, an approach to learning characterized by more surface learning and less deep and strategic learning.

FIGURE 1 HERE

A depiction of the mediation models exists in Figures 1 and 2. Figure 1 represents strict mediation, in which Dark Triad traits are anticipated to predict depression and learning styles through mental toughness. Figure 2 depicts partial mediation, and differs from strict mediation in the sense the predictor variables are assumed to have direct and indirect effects. This model is important given the evidence linking Dark Triad traits directly with learning styles and depression (e.g., Schyns et al., 2019).

FIGURE 2 HERE

2.0 Method

2.1 Participants and procedure

Prior to commencement, participants received an information sheet describing the purpose of the study and provided consent. Instructions then directed participants to complete an online self-report measure. Participants were informed that a focus of the study included comparing their responses with how they respond in a later survey, and were accordingly asked to provide their student ID number for the purposes of matching up only (deletion of ID numbers occurred as soon as this was achieved). First year social science undergraduates from a post-92 UK university completed study measures at the beginning of the 2019/2020 academic year (Time 1) and at the start of the second term, approximately three months later (Time 2). This time interval allowed sufficient time for well-being outcomes to change (Amati et al., 2010) and reflected a semi-longitudinal panel design. Counterbalancing of scale order prevented order effects. Participants under 18 years of age, who did not study at university, and suffered from a diagnosed mental illness, represented the exclusion criteria. The procedure for both time points was identical.

Time 1 comprised 252 participants (50 males and 202 females, mean age = 19.31, *SD* = 2.62, range = 18 to 37, 89 lived at home whilst studying and 161 lived away from home). In total, 154 completed the Time 2 survey, with 100 having participated at Time 1 (17 males and 83 females, mean age = 19.02, *SD* = 1.33, range = 18 to 24, 35 lived at home whilst studying and 65 lived away from home). Attrition analyses revealed that both samples were similar in terms of demographics (i.e., 35.6% lived at home and 64.4% lived away from home at Time 1, 35% and 65% lived at home and away from home respectively at Time 2; 19% and 81% were male and female at Time 1, 17% and 83% were male and female at Time 2). In addition, missing value analysis using Little's (1998) missing completely at random (MCAR) test was not significant, χ^2 (952) = 723.38, p = 1.0, suggesting values are missing completely at random. This is further supported by the normed chi-square (χ^2 / *df*) being below the threshold of 2 (i.e., 0.75) (Silva & Calheiros, 2018). Therefore, missing-ness on specific variables was not related

to the other unmeasured or measured variables (Enders, 2010). The authors performed additional attrition analyses comparing participants who completed the study with those who dropped out (Becht et al., 2019). Non-significant mean differences existed in relation to the study variables, $F(8, 240) = 1.61$, $p = .12$, $\eta^2 = .05$. Based on the support for MCAR and the non-significant attrition analyses, the authors made use of all study data, thus involving respondents with and without missing data in ensuing analyses.

Recruitment occurred through classes and email invitation. The study received ethical approval from the relevant governing/institutional review board (details of the specific review board withheld for anonymity). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Individual participants provided informed consent.

2.2 Measures

The Short Dark Triad questionnaire (SD3) (T1). The SD3 assesses subclinical narcissism, subclinical psychopathy and Machiavellianism (Jones & Paulhus, 2014), and is widely used for measuring the Dark Triad (Vaughan, Madigan, Carter, & Nicholls, 2019). Maples, Lamkin, and Miller (2014) suggested that the SD3 narcissism scale measures primarily the grandiose aspects of this construct. The SD3 comprises 27 items, 9 for each subscale with responses given on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Items capture general characteristics/tendencies and examples include 'It's not wise to tell your secrets' and 'Many group activities tend to be dull without me'. Construct, concurrent and predictive validity exist for the measure alongside acceptable internal consistency (Jones & Paulhus, 2014). In this study, Machiavellianism (ω = .70), narcissism (ω = .72) and psychopathy (ω = .75) demonstrated acceptable omega reliability, with values > .7 considered satisfactory for this index (Bado, Rebustini, Jamieson, Cortellazzi, & Mialhe, 2018).

The Mental Toughness Questionnaire 10 (MTQ10) (T1 and T2). The MTQ10 was developed and validated by Papageorgiou et al. (2018) and is an abridged version of the MTQ48 (Clough, Earle, & Sewell, 2002). It comprises the highest line-adding items in each of the four dimensions (i.e., challenge, commitment, control and confidence). For example, 'I generally cope well with any problems that occur'. The MTQ10 uses a 5-point Likert scale and provides an overall score of mental toughness. The measure assesses general characteristics/tendencies. Acceptable internal consistency and test-retest reliability exists for the measure (Papageorgiou et al., 2018). In addition, convergent validity (Telli, Maulana, & Helms-Lorenz, 2021) and predictive validity (Dagnall, Denovan, Papageorgiou, Clough, Parker, & Drinkwater, 2019) have been established for this measure. Specifically, Dagnall et al. (2019) revealed that the MTQ10 was a strong predictor of life satisfaction, which is an established index of adjustment that should (and did) align with higher levels of mental toughness (Gerber et al., 2013). Analyses of factor structure and invariance support construct validity (Dagnall et al., 2019; Papageorgiou et al., 2018). Satisfactory internal consistency was evident in this study, T1 ω = .73; T2 ω = .74.

The Beck Depression Inventory (BDI) (T1 and T2). The BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) measured characteristic attitudes and symptoms of depression. The scale comprises a 21-item self-report rating inventory and assessed depression symptoms during the past week. Example items include 'I feel I have nothing to look forward to'. The BDI is a very popular measure of depression symptoms (Enns, Cox, Parker, & Guertin, 1998), and demonstrates high internal consistency, with reliability coefficients of .86 and .81 for psychiatric and non-psychiatric populations respectively (Beck, Steer, & Carbin, 1988). Extensive testing of validity for the BDI exists. For example, Beck et al. (1988) reviewed twenty years of research on the BDI, presenting evidence of concurrent, convergent, predictive

and construct validity using psychiatric and nonpsychiatric samples. High omega reliability was evident in this study, T1 ω = .91; T2 ω = .95.

The Revised Approaches to Studying Inventory (RASI) (T1 and T2). Entwistle, Tait, and McCune (2000) developed the RASI to measure students' approaches to learning in relation to three main domains: deep, surface and strategic learning. It is a revised version of the Approaches to Studying Inventory (Entwistle & Ramsden, 1983) and aims to capture how students typically approach learning tasks and associated perceptions. Example items include 'I usually set out to understand for myself the meaning of what we have to learn', 'I organize my study time carefully to make the best use of it', and 'I'm not really interested in this course, but I have to take it for other reasons'. In this study, the authors focused on the measure generally (i.e., not course or module specific) given the sample comprised a range of students across subject areas. RASI contains 52 items and an accompanying response scale from 1 (disagree) to 5 (agree).

Entwistle (2013) reported acceptable reliability of the measure across countries, in addition to construct and convergent validity. Further research indicates predictive validity (e.g., Gadelrab, 2011). In this study, reliability was good for deep learning, T1 ω = .86; T2 ω = .87. Similarly, strategic learning possessed good reliability, T1 ω = .85; T2 ω = .87, as did surface learning, T1 ω = .78; T2 ω = .81.

2.3 Data analysis

Initially, Harman's single-factor test via exploratory factor analysis (EFA) assessed whether common method variance (CMV) was a problem within the present data set. CMV refers to variance attributable to the measurement method rather than the constructs, and is potentially an issue when dependent and focal explanatory variables are perceptual measures derived from the same respondent (Podsakoff & Organ, 1986).

Scrutiny of bivariate correlations occurred to explore basic associations among the study variables. Analysis (via Mplus 7.4; Muthén & Muthén, 2015) subsequently comprised the assessment of mediation models to examine the hypothesized mediating role of mental toughness in relation to Dark Triad traits, symptoms of depression and learning styles. Models involved strict mediation and partial mediation. Strict mediation included the hypothesized model (i.e., Model 1; direct paths from Dark Triad traits to mental toughness, and from mental toughness to depression symptoms and learning styles). Partial mediation (Model 2) included these paths, but additionally incorporated paths from Dark Triad traits to depression symptoms and learning styles. This approach was important to test if the effects of the Dark Triad traits on depression and learning styles take place in the absence of any intervening variable, or if the effects are channeled through mental toughness (Tighezza, 2013). Each mediation model controlled for initial levels (T1) of the endogenous (i.e., dependent) variables (depression and learning styles) (Dakanalis, Clerici, & Carrà, 2016).

Model testing utilized full information maximum likelihood (FIML) estimation to handle missing data given similarities existed between T1 and T2 participants on demographics (Campbell & Renshaw, 2013), non-significant differences existed on study variables between completers and attriters, and the data met the assumption of MCAR (Becht et al., 2019; Gerbino et al., 2018). FIML produces unbiased missing data estimates under tolerable missing data patterns including MCAR (Enders, 2010). Explicitly, missing values can be reliably handled using FIML when these conditions are met (Becht et al., 2019).

The chi-square statistic, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root-Mean-Square Error of Approximation (RMSEA) and Standardized Root-Mean-Square Residual (SRMR) evaluated model fit. An acceptable model required CFI > .90, TLI > .90, SRMR < .08, and RMSEA < .10 (Browne & Cudeck 1993). For RMSEA the 90% confidence interval (CI) was included. Comparison of models included the Satorra-Bentler chi-square

difference test (S-$B\chi^2$; Satorra & Bentler, 2001) alongside the Akaike Information Criterion (AIC). An AIC difference (ΔAIC) greater than 10 indicates that a comparison model evidences weaker fit than a more parsimonious alternative (Burnham & Anderson, 2002). Testing the significance of the indirect or mediating effects involved running the superior model with 1000 bootstrap samples to produce 95% bias-corrected confidence intervals (Preacher & Hayes, 2008).

3.0 Results

3.1 Preliminary analysis

Preliminary assessment of univariate normality revealed that skewness values fell between -2.0 and +2.0, and kurtosis between -4.0 and +4.0 (Field & Miles, 2010) (Table 1). Harman's single-factor test revealed that a single factor (with an Eigenvalue of 17.11) underlying the data would only account for 11.64% of the variance, well below the classic threshold of 50% (Harman, 1960). This indicated that CMV did not significantly affect the study variables and the findings. Bivariate correlations for T1 depression indicated small to moderate significant negative relationships with narcissism (r of -.19, p = .040) and T1 mental toughness (r of -.39, p < .001), and small significant positive correlations with Machiavellianism (r of .19, p = .002) and psychopathy (r of .23, p < .001). T2 depression demonstrated small to large significant negative relationships with narcissism (r of -.18, p = .050), T1 mental toughness (r of -.44, p < .001), and T2 mental toughness (r of -.66, p < .001).

For learning styles, T1 Deep Learning indexed small significant positive correlations with narcissism (r of .16, p = .010), and T1 mental toughness (r of .29, p < .001). T2 Deep Learning evidenced moderate to large significant positive associations with narcissism (r of .31, p < .001), T1 and T2 mental toughness (r of .34 and p < .001 in each instance), T1 Strategic Learning (r of .35, p < .001), and a moderate significant negative association with T1 Surface Learning (r of -.32, p < .001). T1 Strategic Learning possessed a small to moderate significant

positive correlation with T1 mental toughness (*r* of .23, $p < .001$) and T1 Deep Learning (*r* of .52, $p < .001$). Small significant negative correlations existed with psychopathy (*r* of -.18, $p = .005$) and T1 depression (*r* of -.22, $p < .001$). T2 Strategic Learning demonstrated small to large significant positive associations with narcissism (*r* of .20, $p = .045$), T1 mental toughness (*r* of .34, $p < .001$), T1 Deep Learning (*r* of .38, $p < .001$), T2 mental toughness (*r* of .52, $p < .001$), and T2 Deep Learning (*r* of .52, $p < .001$). Small to moderate significant negative associations occurred with psychopathy (*r* of -.20, $p = .049$), T1 depression (*r* of -.30, $p = .002$), T1 Surface Learning (*r* of -.37, $p < .001$), and T2 depression (*r* of -.40, $p < .001$).

T1 Surface Learning exhibited small to moderate significant positive correlations with Machiavellianism (*r* of .24, $p < .001$), psychopathy (*r* of .27, $p < .001$), and T1 depression (*r* of .43, $p < .001$). Small to moderate significant negative associations existed with T1 mental toughness (*r* of -.38, $p < .001$), T1 Deep Learning (*r* of -.30, $p < .001$), and T1 Strategic Learning (*r* of -.25, $p < .001$). T2 Surface Learning exhibited small to moderate significant positive relationships with T1 depression (*r* of .25, $p = .012$), T1 Surface Learning (*r* of .61, $p < .001$), and T2 depression (*r* of .30, $p = .002$). Small to moderate significant negative relationships occurred with narcissism (*r* of -.22, $p = .033$), T1 mental toughness (*r* of -.40, $p < .001$), T1 Strategic Learning (*r* of -.35, $p < .001$), T2 mental toughness (*r* of -.41, $p < .001$), T2 Deep Learning (*r* of -.25, $p = .012$), and T2 Strategic Learning (*r* of -.36, $p < .001$).

TABLE 1 HERE

3.2 Path analyses

A test of the hypothesized strict mediational model (Model 1) for symptoms of depression and learning styles indicated good fit on all indices, χ^2 (32, $N = 251$) = 49.48, $p = .03$, CFI = .95, TLI = .93, RMSEA = .04 (90% CI of .02 to .07), SRMR = .05. Inspection of modification indices suggested one un-estimated correlation possessed a large MI (> 5.0), i.e., T1 psychopathy with T2 mental toughness. However, this was left unspecified given it

conflicted with the strict mediation assumptions of the model (i.e., T2 mental toughness assumed to mediate T1 Dark Triad traits).

The partial mediation model (Model 2) revealed good fit on all indices but TLI and RMSEA, χ^2 (1, N = 251) = 7.54, p = .006, CFI = .98, TLI = .13, RMSEA = .16 (90% CI of .07 to .27), SRMR = .03. In addition to poorer model fit, this model did not provide a significantly better data-fit than the strict mediation model, $S\text{-}B\chi^2$ (31) = 44.38, p = .06, and evidenced an ΔAIC of 15.16 (i.e., partial model AIC of 16544.85 vs. strict model AIC of 16529.69). Thus, the more parsimonious model (i.e., the strict mediation model) indicated superior fit (Yuan & Bentler, 2004). Figure 3 displays standardized regression coefficients of this model, which accounted for 63%, 45%, 53%, and 41% of the variance in depression, Deep Learning, Strategic Learning, and Surface Learning respectively.

FIGURE 3 HERE

Assessment of indirect effects using the bootstrap procedure (Table 2) indicated that mental toughness significantly mediated the association between narcissism and depression, β = -.25, p = .005 (95% CI = -.40, -.12). In addition, mental toughness significantly mediated the narcissism and Strategic Learning relationship, β = .14, p = .03 (95% CI = .05, .24), and the narcissism and Surface Learning relationship, β = -.10, p = .05 (95% CI = -.20, -.03). No other significant indirect effects existed.

TABLE 2 HERE

Given Machiavellianism and psychopathy did not demonstrate meaningful direct or indirect effects in relation to mental toughness and learning styles, analysis tested a more restrictive strict mediation model with paths from Machiavellianism and psychopathy fixed to zero (Model 3). This model did not provide a significantly better fit than the strict mediation model, $S\text{-}B\chi^2$ (2) = 1.54, p = .46, with an ΔAIC of 2.1 (i.e., strict model AIC of 16529.69 vs. Model 3 AIC of 16527.59).

Further additional analyses helped in evaluating the degree to which mental toughness was a suitable mediator in the tested models. This included swapping the mediator of mental toughness with an alternative outcome variable. Specifically, T2 depression (Model 4), T2 Deep Learning (Model 5), T2 Strategic Learning (Model 6), and T2 Surface Learning (Model 7). Model 4 revealed an ΔAIC of .76. However, no significant indirect effects existed in relation to mental toughness and all learning styles (i.e., all *p*-values > .05). Model 5 evidenced an unsatisfactory ΔAIC of 21.64 and non-significant indirect effects relative to mental toughness, depression, Strategic Learning and Surface Learning. Similarly, Model 6 reported an ΔAIC of 11.03 alongside non-significant indirect effects concerning mental toughness, depression, Deep Learning and Surface Learning. Model 7 revealed an ΔAIC of 3.76; however, no significant indirect effects existed in relation to mental toughness, depression, Deep Learning and Strategic Learning. Comparatively speaking, these results indicate that mental toughness is appropriate as a mediator in relation to Dark Triad traits, depression and learning styles.

As a further test of relationship direction (i.e., the assumption that Dark Triad traits predict mental toughness, and accordingly depression and learning styles), analyses tested a reverse causality model (Model 8). Here, the endogenous variables were exchanged with the predictor variables to examine reverse relationships. Model fit was unsatisfactory, with a CFI of .85, TLI of .64, RMSEA of .11, and SRMR of .10. Additional tests revealed this model did not provide a significantly better fit than Model 1, $S\text{-}B\chi^2$ (3) = 53.51, p = 1.0, with an ΔAIC of 77.52 (i.e., Model 1 AIC of 16529.69 vs. Model 8 AIC of 16607.21).

Overall, the findings partially supported the first hypothesis in the sense narcissism predicted lower depression, surface learning and more strategic learning indirectly via mental toughness. Mediating effects did not exist, however, in relation to deep learning. Conversely,

the results did not support the second hypothesis (i.e., psychopathy and Machiavellianism expected to predict depression and learning via mental toughness).

4.0 Discussion

Currently, very few studies exist that have explored the role of dark personality traits in education and their impact on educationally relevant traits, behaviours and characteristics such as learning styles. The literature so far suggests that Dark Triad traits may influence learning and education performance indirectly (e.g., acting as risk or resilience factors for psychopathology) and that their role for education outcomes may be both important and complex (e.g., Papageorgiou et al., 2020). This study incorporated a semi-longitudinal assessment of the Dark Triad to explore the different learning strategies that university students, who score high on each of these traits, adopt in Higher Education. Furthermore, consideration of mental toughness as a mediator relative to the association between the Dark Triad, learning styles and symptoms of depression occurred.

Narcissism was the only dark trait to associate with positive outcomes. Specifically, narcissism was associated indirectly (through mental toughness) with lower scores on symptoms of depression, reduced surface learning and increased strategic learning. In addition, narcissism correlated positively with strategic learning (Time 2 only) and deep learning. The positive association between grandiose narcissism and learning style, and the negative association between narcissism and symptoms of depression are in line with the notion that some aspects of narcissism may be beneficial in certain contexts. The findings may also indirectly support other recent studies (e.g., Dinic, Wertag, Tomašević, and Sokolovska, 2019) indicating low clustering and closeness in network analyses of narcissism and the Dark Tetrad (a new conceptualization of four ‘dark’ traits including sadism; Buckels, Jones, & Paulhus, 2013), which signifies separation/distance of narcissism from other dark traits. However, it should be noted here that this interpretation of the findings requires further exploration, when

considering other recent evidence to suggest substantial interpretive difficulties when using findings from residualized analyses (e.g., multiple regression) partialing the variance of the Dark Triad traits to build nomological networks around Dark Triad constructs (Sleep, Lynam, Hyatt, & Miller, 2017).

Regarding the association of grandiose narcissism (as captured with the SD3 in this study) with lower symptoms of psychopathology through mental toughness, these findings provide semi-longitudinal evidence to support previous results based on cross-sectional data (e.g., Papageorgiou et al., 2019b). The positive indirect association between narcissism and strategic learning, and the indirect negative association between narcissism and surface learning that was reported in the current study, constitute new evidence that highlight the relevance of this seemingly dark trait for learning and education. It appears that the ability of grandiose narcissists to commit confidently to a target, by virtue of the association with mental toughness, offers the opportunity to focus and plan their learning accordingly. In the case of strategic and surface learning, narcissism likely facilitates more of a strategic focus on achieving the highest grades, and mental toughness maintains this via qualities of commitment, persistence and confidence (Clough et al., 2002).

Additionally, further analyses highlighted the significance of mental toughness as a mediator given significant indirect effects did not exist in competing models. The central characteristics inherent in mental toughness are therefore important for benefitting outcomes including depression and encouraging an approach to learning typified by effective strategizing and a lower tendency to engage minimally with learning/course requirements. Indeed, research consistently indicates that mental toughness is associated with positive psychological traits, efficient coping strategies and positive outcomes in education and mental health (Lin et al., 2017).

Machiavellianism and psychopathy did not indirectly effect symptoms of depression or learning styles. These findings should not be taken as conclusive evidence to support that Machiavellianism and psychopathy do not have a role to play in relation to learning or psychopathology. Indeed, psychopathy in particular demonstrated negative associations with strategic learning and a positive association (Time 1 only) with surface learning. This agrees with the notion that individuals higher in psychopathy are more likely to choose quick, spontaneous strategies to increase educational performance. Furthermore, both Machiavellianism and psychopathy evidenced positive associations with symptoms of depression, consistent with previous research (e.g., Jonason, Baughman, Carter, & Parker, 2015). Lastly, a test of reverse causality reported weaker model fit, thus supporting the suggested direction of the variables; specifically, that Dark Triad traits were predictive of mental toughness, depression and learning styles.

However, the results should be replicated in studies that address some of the limitations described below and refer mainly to existing measures failing to capture the multidimensionality of the dark traits and Machiavellianism in particular. For example, while Machiavellians are characterized by a long-term strategic focus—hence one would expect positive associations between Machiavellianism and strategic learning—typical assessments of the trait capture variance that is common (as opposed to unique) between Machiavellianism and psychopathy (Truhan et al., 2020). This contributes to Machiavellianism showing typically a pattern of correlations that is closer to those observed for psychopathy (i.e., assessments of Machiavellianism fail to capture the construct as articulated in theoretical descriptions; Miller, Hyatt, Maples-Keller, Carter, & Lynam, 2017).

4.1 Limitations

This study should be considered in light of some limitations. Explicitly, data was self-report and therefore potentially susceptible to reporting bias and procedural distortion (i.e.,

social desirability). In addition, the sample comprised mainly of female participants, which restricts the generalizability of the findings to males, and the sample was relatively small given the utilization of convenience sampling. Perhaps the most important limitation involves the measures used in this study. The main outcome measure of learning did not include any objective assessment of performance (e.g., actual grades) to allow exploration of the degree to which more strategic learning, as reported by the participants, predicts better learning indexed by higher performance in the university. Mental toughness (the mediator) was assessed as a unidimensional construct. Previous work is inconclusive as to whether this trait is unidimensional or multidimensional, however, using multidimensional models of mental toughness (e.g., the 4Cs model) may provide additional clarity on the mechanisms underlying the associations that this trait mediates (see Papageorgiou, Mutz, Lin, & Clough, 2018 for a discussion).

Finally, extant measures may not be comprehensive enough to capture the full array of Dark Triad facets. For example, Rogoza and Cieciuch (2018) examined the structure of the Dark Triad, via the Polish translation of the SD3, alongside individual measures (Levenson Self-Report Psychopathy Scale, Narcissism Personality Inventory, MACH-IV – all translated) and identified twelve distinct facets. More recently, Truhan and colleagues (2020) used network analyses to explore a number of common measures used to assess the Dark Triad and reported eight facets for Narcissism, six facets for Psychopathy and four facets of Machiavellianism. The study highlighted the multidimensionality of the dark traits that existing personality measures fail to capture comprehensively, and the need for further research to refine measurement of the Dark Triad traits and Machiavellianism in particular. These findings suggest that present Dark Triad measures provide only limited snapshots of traits. Accordingly, future research needs to replicate the current study using multidimensional Dark Triad

instruments. This will extend research and offer invaluable insights into which aspects of the Dark Traits are adaptive as opposed to maladaptive for learning and psychopathology.

4.2. Conclusions

In conclusion, the present semi-longitudinal study is the first to demonstrate a link between a dark trait, namely grandiose narcissism, and learning style. There are no previous studies exploring the role of narcissism in learning styles, as such, it is impossible to discuss here how the current findings corroborate previous studies on this topic. However, longitudinal research has suggested that grandiose narcissism may predict higher grades in high school through mental toughness (Papageorgiou et al., 2018). Future research should expand on these results exploring longitudinally the degree to which narcissism predicts actual performance (e.g., university grades) indirectly via higher mental toughness and more strategic learning. In order to establish the robustness of these results, subsequent studies should address some of the aforementioned limitations and attempt to replicate the findings across a range of educational settings, samples and measures of learning. Finally, future work should consider how to identify and promote adaptive narcissistic tendencies, while curtailing the dark traits' maladaptive aspects.

Acknowledgements

The authors are grateful to the study participants for their contribution to this research. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data Availability Statement

The study data is available at Figshare: http://doi.org/10.6084/m9.figshare.14790393

References

Amati, M., Tomasetti, M., Ciuccarelli, M., Mariotti, L., Tarquini, L. M., Bracci, M., Baldassari, M., Balducci, C., Alleva, R., Borghi, B., & Mocchegiani, E. (2010). Relationship of job satisfaction, psychological distress and stress-related biological parameters among healthy nurses: A longitudinal study. *Journal of Occupational Health*, *52*, 31–38. https://doi.org/10.1539/joh.L9042

Bado, F. M. R., Rebustini, F., Jamieson, L., Cortellazzi, K. L., & Mialhe, F. L. (2018). Evaluation of the psychometric properties of the Brazilian version of the Oral Health Literacy Assessment in Spanish and development of a shortened form of the instrument. *PloS one*, *13*, e0207989. https://doi.org/10.1371/journal.pone.0207989

Becht, A. I., Luyckx, K., Nelemans, S. A., Goossens, L., Branje, S. J., Vollebergh, W. A., & Meeus, W. H. (2019). Linking identity and depressive symptoms across adolescence: A multisample longitudinal study testing within-person effects. *Developmental psychology*, *55*, 1733-1742. https://doi.org/10.1037/dev0000742

Beck, A. T., Steer, R. A., & Carbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review*, *8*, 77–100. https://doi.org/10.1016/0272-7358(88)90050-5

Beck, A. T., Ward, C., Mendelson, M., Mock, J., & Erbaugh, J. (1961). Beck depression inventory (BDI). *Archives of General Psychiatry*, *4*, 561–571. https://doi.org/10.1001/archpsyc.1961.01710120031004

Besser, A., & Zeigler-Hill, V. (2011). Pathological forms of narcissism and perceived stress during the transition to the university: The mediating role of humor styles. *International Journal of Stress Management*, *18*, 197-221. https://doi.org/10.1037/a0024826

Browne, M.W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In: K. A. Bollen & J.S. Long (Eds.), *Testing structural equation models* (pp.136–162). Beverly Hills, CA: Sage.

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

Burnham, K. P. & Anderson, D. R. (2002). Model selection and multimodel inference: A practical information-theoretic approach (2nd ed.). New York, NY: Springer.

Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (1998). The relation between learning styles, the Big Five personality traits and achievement motivation in higher education. *Personality and Individual Differences, 26*, 129–140. https://doi.org/10.1016/S0191-8869(98)00112-3

Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (2000). Intellectual ability, learning style, personality, achievement motivation and academic success of psychology students in higher education. *Personality and Individual Differences, 29*, 1057–1068. https://doi.org/10.1016/S0191-8869(99)00253-6

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming.* New York, NY: Routledge/Taylor & Francis Group.

Campbell, S. B., & Renshaw, K. D. (2013). PTSD symptoms, disclosure, and relationship distress: Explorations of mediation and associations over time. *Journal of Anxiety Disorders*, *27*, 494-502. https://doi.org/10.1016/j.janxdis.2013.06.007

Campbell, W. K., Bonacci, A. M., Shelton, J., Exline, J. J., & Bushman, B. J. (2004). Psychological entitlement: Interpersonal consequences and validation of a self-report measure. *Journal of Personality Assessment, 83,* 29–45. https://doi.org/10.1207/s15327752jpa8301_04

Clough, P., Earle, K., & Sewell, D. (2002). Mental toughness: The concept and its measurement. In I. Cockerill (Ed.), *Solutions in sport psychology* (pp. 32–45). London, UK: Thomson.

Dakanalis, A., Clerici, M., & Carrà, G. (2016). Narcissistic vulnerability and grandiosity as mediators between insecure attachment and future eating disordered behaviors: a prospective analysis of over 2,000 freshmen. *Journal of clinical psychology*, *72*, 279-292. https://doi.org/10.1002/jclp.22237

Dagnall, N., Denovan, A., Papageorgiou, K. A., Clough, P. J., Parker, A., & Drinkwater, K. G. (2019). Psychometric assessment of shortened Mental Toughness Questionnaires (MTQ): factor structure of the MTQ-18 and the MTQ-10. *Frontiers in psychology*, *10*, 1933. https://doi.org/10.3389/fpsyg.2019.01933

Dickinson, K. A., & Pincus, A. L. (2003). Interpersonal analysis of grandiose and vulnerable narcissism. *Journal of Personality Disorders, 17*, 188–207. https://doi.org/10.1521/pedi.17.3.188.22146

Dinić, B. M., Wertag, A., Tomašević, A., & Sokolovska, V. (2019). Centrality and redundancy of the Dark Tetrad traits. *Personality and Individual Differences*, *155*, 109621. https://doi.org/10.1016/j.paid.2019.109621

Duff, A., Boyle, E., Dunleavy, K., & Ferguson, J. (2004). The relationship between personality, approach to learning and academic performance. *Personality and Individual Differences, 36*, 1907–1920. https://doi.org/10.1016/j.paid.2003.08.020

Dumfart, B., & Neubauer, A. C. (2016). Conscientiousness Is the Most Powerful Noncognitive Predictor of School Achievement in Adolescents. *Journal of Individual Differences, 37*, 8–15. https://doi.org/10.1027/1614-0001/a000182

Enders, C. K. (2010). *Applied missing data analysis.* New York, NY: Guilford Press.

Enns, M. W., Cox, B. J., Parker, J. D., & Guertin, J. E. (1998). Confirmatory factor analysis of the Beck Anxiety and Depression Inventories in patients with major depression. *Journal of affective disorders*, *47*, 195-200. https://doi.org/10.1016/S0165-0327(97)00103-1

Entwistle, N. (2013). *The approaches and study skills inventory for students (ASSIST).* Centre for Research on Learning and Instruction, University of Edinburgh, UK.

Entwistle, N., & Ramsden, P. (2015). *Understanding student learning*. New York, NY: Routledge.

Entwistle, N., Tait, H., & McCune, V. (2000). Patterns of response to an approaches to studying inventory across contrasting groups and contexts. *European Journal of psychology of Education, 15*(1), 33-48.

Field, A., & Miles, J. (2010). *Discovering statistics using SAS*. London, UK: Sage.

Furnham, A., Richards, S. C., & Paulhus, D. L. (2013). The Dark Triad of personality: A 10 year review. *Social and Personality Psychology Compass, 7*, 199-216. https://doi.org/10.1111/spc3.12018

Gadelrab, H. F. (2011). Factorial structure and predictive validity of approaches and study skills inventory for students (ASSIST) in Egypt: A confirmatory factor analysis approach. *Electronic journal of Research in Educational Psychology*, *9*, 1197-1218. https://doi.org/10.25115/ejrep.v9i25.1501

Gerber, M., Brand, S., Feldmeth, A. K., Lang, C., Elliot, C., Holsboer-Trachsler, E., & Pühse, U. (2013). Adolescents with high mental toughness adapt better to perceived stress: A longitudinal study with Swiss vocational students. *Personality and Individual Differences*, *54*, 808-814. https://doi.org/10.1016/j.paid.2012.12.003

Gerbino, M., Zuffianò, A., Eisenberg, N., Castellani, V., Kanacri, B. P. L., Pastorelli, C., & Caprara, G. V. (2018). Adolescents' prosocial behavior predicts good grades beyond

intelligence and personality traits. *Journal of Personality*, *86*, 247-260. https://doi.org/10.1111/jopy.12309

Harman, H. H. (1960). *Modern factor analysis.* Chicago, IL: University of Chicago Press.

Hengartner, M. P. (2015). The detrimental impact of maladaptive personality on public mental health: a challenge for psychiatric practice. *Frontiers in Psychiatry, 6*, 87. https://doi.org/10.3389/fpsyt.2015.00087

Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of psychiatric research*, *47*(3), 391-400.

Jonason, P. K., Baughman, H. M., Carter, G. L., & Parker, P. (2015). Dorian Gray without his portrait: Psychological, social, and physical health costs associated with the Dark Triad. *Personality and Individual Differences*, *78*, 5-13. https://doi.org/10.1016/j.paid.2015.01.008

Jones, D. N., & Paulhus, D. L. (2014). Introducing the short dark triad (SD3) a brief measure of dark personality traits. *Assessment*, *21*, 28–41. https://doi.org/10.1177/1073191113514105

Kapoor, H. (2015). The creative side of the Dark Triad. *Creativity Research Journal*, *27*, 58-67. http:/doi.org/10.1080/10400419.2014.961775

Kharb, P., Samanta, P. P., Jindal, M., & Singh, V. (2013). The learning styles and the preferred teaching—learning strategies of first year medical students. *Journal of clinical and diagnostic research*, 7, 1089-92. http:/doi.org/10.7860/JCDR/2013/5809.3090

Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American statistical Association*, *83*, 1198-1202. https://doi.org/10.4018/IJACI.2019040105

Lin, Y., Clough, P. J., Welch, J., & Papageorgiou, K. A. (2017). Individual differences in mental toughness associate with academic performance and income. *Personality and Individual Differences*, *113*, 178–183. https://doi.org/10.1016/j.paid.2017.03.039

Lin, Y., Mutz, J., Clough, P. J., & Papageorgiou, K. A. (2017). Mental toughness and individual differences in learning, educational and work performance, psychological well-being, and personality: A systematic review. *Frontiers in Psychology, 8,* 1345. https://doi.org/10.3389/fpsyg.2017.01345

Maples, J. L., Lamkin, J., & Miller, J. D. (2014). A test of two brief measures of the dark triad: The dirty dozen and short dark triad. *Psychological Assessment, 26*, 326-331. https://doi.org/10.1037/a0035084

Martinez, M. A., Zeichner, A., Reidy, D. E., & MiIler, J. D. (2008). Narcissism and displaced aggression: Effects of positive, negative, and delayed feedback. *Personality and Individual Differences, 44,* 140–149. https://doi.org/10.1016/j.paid.2007.07.012

Miller, J. D., Hoffman, B. J., Gaughan, E. T., Gentile, B., Maples, J., & Campbell, W. K. (2011). Grandiose and vulnerable narcissism: A nomological network analysis. *Journal of Personality, 79*, 1013–1042. https://doi.org/10.1111/j.1467-6494.2010.00711.x

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

Miller, J. D., Lynam, D. R., Siedor, L., Crowe, M., Campbell, W. K. (2018). Consensual lay profiles of narcissism and their connection to the five-factor narcissism inventory. *Psychological Assessment 30,* 10–18. https://doi.org/10.1037/pas0000460

Muris, P., Merckelbach, H., Otgaar, H., & Meijer, E. (2017). The malevolent side of human nature: A meta-analysis and critical review of the literature on the dark triad (narcissism,

Machiavellianism, and psychopathy). *Perspectives on Psychological Science, 12*, 183–204. https://doi.org/10.1177/1745691616666070

Muthén, L. K., & Muthén, B. O. (2015). *Mplus User's Guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.

Nathanson, C., Paulhus, D. L., & Williams, K. M. (2006). Personality and misconduct correlates of body modification and other cultural deviance markers. *Journal of Research in Personality, 40,* 779–802. https://doi.org/10.1016/j.jrp.2005.09.002

Papageorgiou, K.A., Likhanov, M., Costantini, G., Tsigeman, E., Zaleshin, M., Budakova, A., & Kovas, Y. (2020). Personality, behavioural strengths and difficulties and performance of Adolescents with high achievements in Science, Literature, Art and Sports. *Personality and Individual Differences, 160,* 109920. https://doi.org/10.1016/j.paid.2020.109917

Papageorgiou, K. A., Benini, E., Bilello, D., Gianniou, F. M., Clough, P. J., & Costantini, G. (2019a). Bridging the gap: A network approach to Dark Triad, Mental Toughness, the Big Five, and perceived stress. *Journal of Personality, 87*, 1250–1263. https://doi.org/10.1111/jopy.12472

Papageorgiou, K. A., Denovan, A., & Dagnall, N. (2019b). The positive effect of narcissism on depressive symptoms through mental toughness: Narcissism may be a dark trait but it does help with seeing the world less grey. *European Psychiatry*, *55*, 74–79. https://doi.org/10.1016/j.eurpsy.2018.10.002

Papageorgiou, K. A., Gianniou, F. M., Wilson, P., Moneta, G. B., Bilello, D., & Clough, P. J. (2019c). The bright side of dark: Exploring the positive effect of narcissism on perceived stress through mental toughness. *Personality and Individual Differences, 139,* 116–124. https://doi.org/10.1016/j.paid.2018.11.004

Papageorgiou, K. A., Malanchini, M., Denovan, A., Clough, P. J., Shakeshaft, N., Schofield, K., & Kovas, Y. (2018). Longitudinal associations between narcissism, mental toughness

and school achievement. *Personality and Individual Differences*, *131*, 105–110. https://doi.org/10.1016/j.paid.2018.04.024

Papageorgiou, K. A., Wong, B., & Clough, P. J. (2017). Beyond good and evil: Exploring the mediating role of mental toughness on the Dark Triad of personality traits. *Personality and Individual Differences, 119,* 19–23. https://doi.org/10.1016/j.paid.2017.06.031

Papageorgiou, K. A., Mutz, J., Lin, Y., & Clough, P. J. (2018). Mental toughness: A personality trait that is relevant across achievement contexts and mental health outcomes. In V. Zeigler-Hill, & T. K. Shackelford (Eds.), *The Sage Handbook of Personality and Individual Differences: Applications of Personality and Individual Differences* (p. 588). Los Angeles, CA: Sage.

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

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, 12, 531–544. https://doi.org/10.1177/014920638601200408

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, *40*, 879-891. https://doi.org/10.3758/BRM.40.3.879

Ramsden, P. (1992). *Learning to teach in higher education*. London, UK: Routledge.

Richardson, J. T. E. (2005). Students' perceptions of academic quality and approaches to studying in distance education. *British Educational Research Journal*, *31*, 1–21. https://doi.org/10.1080/0141192052000310001

Rogoza, R., & Cieciuch, J. (2018). Dark Triad traits and their structure: An empirical approach. *Current Psychology*, 1–16. https://doi.org/10.1007/s12144-018-9834-6

Sabouri, S., Gerber, M., Bahmani, D. S., Lemola, S., Clough, P. J., Kalak, N., ... & Brand, S. (2016). Examining Dark Triad traits in relation to mental toughness and physical activity in young adults. *Neuropsychiatric disease and treatment, 12,* 229. https://doi.org/10.2147/NDT.S97267

Sabouri, S., Gerber, M., Lemola, S., Becker, S. P., Shamsi, M., Shakouri, Z., ... & Brand, S. (2016). Examining Dark Triad traits in relation to sleep disturbances, anxiety sensitivity and intolerance of uncertainty in young adults. *Comprehensive psychiatry, 68,* 103-110. https://doi.org/10.1016/j.comppsych.2016.03.012

Satorra, A., & Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika*, *66*, 507-514. https://doi.org/10.1007/BF02296192

Schyns, B., Wisse, B., & Sanders, S. (2019). Shady strategic behavior: Recognizing strategic followership of Dark Triad followers. *Academy of Management Perspectives*, *33*, 234-249. https://doi.org/10.5465/amp.2017.0005

Silva, C. S., & Calheiros, M. M. (2018). Stop yelling: Interparental conflict and adolescents' self-representations as mediated by their perceived relationships with parents. *Journal of Family Issues*, *39*, 2174-2204. https://doi.org/10.1177/0192513X17741176

Sleep, C. E., Lynam, D. R., Hyatt, C. S., & Miller, J. D. (2017). Perils of partialing redux: The case of the Dark Triad. *Journal of Abnormal Psychology, 126*, 939–950. https://doi.org/10.1037/abn0000278

Telli, S., Maulana, R., & Helms-Lorenz, M. (2020). Students' perceptions of teaching behaviour in Turkish secondary education: a Mokken Scaling of My Teacher Questionnaire. *Learning Environments Research*, 24, 315–337. https://doi.org/10.1007/s10984-020-09329-8

Tighezza, M. H. (2014). Modeling relationships among learning, attitude, self-perception, and science achievement for grade 8 Saudi students. *International Journal of Science and Mathematics Education*, *12*, 721-740. https://doi.org/10.1007/s10763-013-9426-8

Tosevski, D. L., Milovancevic, M. P., & Gajic, S. D. (2010). Personality and psychopathology of university students. *Current Opinion in Psychiatry, 23*, 48–52. https://doi.org/10.1097/YCO.0b013e328333d625

Truhan, E.T., Wilson, P., Mottus, R., & Papageorgiou, K.A. (2020, OnlineFirst). The Many Faces of Dark Personalities: An Examination of the Dark Triad Structure using Psychometric Network Analysis. *Personality and Individual Differences.* https://doi.org/10.1016/j.paid.2020.110502

Turnipseed, D. L., & Landay, K. (2018). The role of the dark triad in perceptions of academic incivility. *Personality and Individual Differences, 135,* 286-291. https://doi.org/10.1016/j.paid.2018.07.029

Turnipseed, D. L., & Cohen, S. R. (2015). Academic entitlement and socially aversive personalities: Does the Dark Triad predict academic entitlement? *Personality and Individual Differences, 82,* 72-75. https://doi.org/10.1016/j.paid.2015.03.003

Twenge, J. M., & Campbell, W. K. (2009). *The narcissism epidemic: Living in the age of entitlement.* New York, NY: Free Press.

Vaughan, R., Madigan, D. J., Carter, G. L., & Nicholls, A. R. (2019). The Dark Triad in male and female athletes and non-athletes: Group differences and psychometric properties of the Short Dark Triad (SD3). *Psychology of Sport and Exercise*, *43*, 64-72. https://doi.org/10.1016/j.psychsport.2019.01.002

Yuan, K. H., & Bentler, P. M. (2004). On chi-square difference and z tests in mean and covariance structure analysis when the base model is misspecified. *Educational and Psychological measurement*, *64*, 737-757. https://doi.org/10.1177/0013164404264853

Williams, K. M., Nathanson, C., & Paulhus, D. L. (2010). Identifying and profiling scholastic cheaters: Their personality, cognitive ability, and motivation. *Journal of Experimental Psychology: Applied*, *16*, 293–307. https://doi.org/10.1037/a0020773

Table 1. Means, standard deviations and correlations for all study variables

Variable	*M*	*SD*	Skew	Kurt.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Mach T1	29.25	5.37	-.17	.47		.27**	.49**	-.06	.19*	.04	-.10	.24**	.04	-.13	.01	-.12	.13
2. Narcissism T1	24.24	5.94	.01	-.56			.48**	.24**	-.19*	.16*	-.05	-.02	.36**	-.18*	.31**	.20*	-.22*
3. Psychopathy T1	18.94	5.93	.48	-.23				.04	.23**	.04	-.18*	.27**	-.04	.11	-.01	-.20*	.19
4. MT T1	34.04	5.33	.17	-.61					-.39**	.29**	.23**	-.38**	.60**	-.44**	.34**	.34**	-.40**
5. Depression T1	31.18	8.97	1.55	2.54						.01	-.22**	.43**	-.49**	.75**	.01	-.30*	.25*
6. Deep LS T1	77.42	10.04	-.30	.17							.52**	-.30**	.32**	-.11	.68**	.38**	-.19
7. Strategic LS T1	59.66	9.68	-.33	-.51								-.25**	.43**	-.29*	.35**	.72**	-.35**
8. Surface LS T1	48.50	8.79	-.59	-.03									-.40**	.32**	-.32**	-.37**	.61**
9. MT T2	34.02	4.89	-.06	.24										-.66**	.34**	.52**	-.41**
10. Depression T2	33.03	11.77	1.70	3.35											-.09	-.40**	.30**
11. Deep LS T2	76.55	10.76	.02	-.22												.52**	-.25*
12. Strategic LS T2	57.28	10.15	.24	.09													-.36**
13. Surface LS T2	50.42	9.03	-.18	.03													

Note. MT = Mental Toughness; Mach = Machiavellianism; T1 = Time point 1, T2 = Time point 2; * $p < .05$, ** $p < .001$

Table 2. Specific indirect effects of Dark Triad traits on symptoms of depression and learning styles through mental toughness

Indirect path	*β*	SE	95% bias-corrected CIs
Narcissism T1 > MT T2 > Depression T2	-.25**	.08	-.40, -.12
Mach T1 > MT T2 > Depression T1	-.06	.09	-.22, .07
Psychopathy > MT T2 > Depression T2	.11	.10	-.05, .30
Narcissism T1 > MT T2 > Deep LS T2	.08	.05	.01, .18
Mach T1 > MT T2 > Deep LS T2	.02	.03	-.02, .09
Psychopathy T1 > MT T2 > Deep LS T2	-.04	.04	-.13, .01
Narcissism T1 > MT T2 > Strategic LS T2	.14*	.06	.05, .24
Mach T1 > MT T2 > Strategic LS T2	.04	.04	-.04, .12
Psychopathy T1 > MT T2 > Strategic LS T2	-.06	.06	-.17, .02
Narcissism T1 > MT T2 > Surface LS T2	-.10*	.05	-.20, -.03
Mach T1 > MT T2 > Surface LS T2	-.03	.03	-.09, .03
Psychopathy T1 > MT T2 > Surface LS T2	.05	.04	-.01, .14

Note. MT = Mental Toughness; Mach = Machiavellianism; * $p < .05$, ** $p < .001$ using Bootstrapping significance estimates (1000 resamples)

Figure 1. The strict mediation model. T1 = Time 1; Time 2 = Time 2.

Figure 2. The partial mediation model. T1 = Time 1; Time 2 = Time 2.

Figure 3. Strict mediational model depicting putative relationships over time between Dark Triad traits, mental toughness, symptoms of depression, and learning styles. Note. standardized regression weights and correlations between variables are shown. Error is not indicated, but was specified for all variables. T1 = Time point 1, T2 = Time point 2; * $p <$ .05, ** $p <$ .001 using Bootstrapping significance estimates (1000 resamples)