Exploring Associations Between Dark Tetrad Personality Traits and Sleep Behaviours

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Statement of Originality

This report contains no material offered for the award of any other degree or diploma, or material previously published, except where due reference is made in the text.

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Abstract

The dark tetrad refers to a group of personality traits consisting of Machiavellianism, narcissism, psychopathy, and sadism. These traits create a collection of distinct but overlapping interrelated domains in personality and behaviours, with a disposition towards antisocial, amoral, or maladaptive and harmful behaviour towards others. Sleep is recognised as a core function of overall health and wellbeing, and essential in supporting physical and mental health, cognition and decision-making, motivation, emotional regulation, and social interactions. Sleep is multifaceted including functions such as duration, sleep-wake consistency, disturbances, and quality, with healthy sleep characterised by achieving adequate durations and good quality. A limited number of studies link poorer sleep quality with dark tetrad traits, however, there is limited understanding regarding broader sleep behaviours. This research aimed to examine self-reported behaviours of sleep duration, disturbances, and sleep-wake consistency to potentially identify associations between dark tetrad traits and broader sleep behaviours. In total 121 participants (18-64 years, 76% female) completed an online survey assessing short dark tetrad, sleep timing questionnaire, Pittsburgh sleep quality index and sleep hygiene index. Data analysis identified significant results in correlations between psychopathy trait, later bedtimes (τ = .15, p = .04), and sleep-wake inconsistency (τ = .14, p = .03). And correlations between poorer sleep hygiene and both Machiavellianism (τ = .25, p < .001) and sadism traits (τ = .16, p =.01). Given bi-directional nature of sleep and personality behaviours, potential exists to improve individuals sleep health and moderate maladaptive, antisocial, or harmful behaviours via sleep hygiene education.

Keywords: Dark tetrad, personality, sleep, sleep behaviours, sleep health.

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Chapter 1: Introduction

Sleep is recognised as a core function for overall health and wellbeing, being identified as essential to support physical and mental health, cognition and decision-making, motivation, emotional regulation, and social interactions (Adams et al., 2017; Medic et al, 2017; Palmer et al., 2023; Stephan et al., 2018). Insufficient or poor sleep has been linked to several negative physical health effects including increased pain symptoms, decreased immune functions, and increased risk of cardiovascular disease, diabetes, and obesity (Meisinger et al., 2007; Medic, 2017, Watson et al., 2015; Wu et al., 2014). Research has also identified insufficient sleep is linked to negative mental and emotional health such as reduced empathy and emotional recognition (Killgore et al., 2008; van der Helm et al., 2010), increased stress responsivity, interpersonal conflict, risk taking and impulsivity (Gordon & Chen, 2014; Krause et al., 2017; Medic, 2017).

Further research has identified a complex and bidirectional association between sleep, emotions and mood states. Indicating that disturbing emotional events influence sleep duration and quality, impacting on subsequent emotional and mood states, suggesting a possible bidirectional causal relationship (Lefter et al., 2022). Further research has identified poorer sleep was significantly associated with increased impulsivity, aggression and hostility (Kamphuis et al., 2013). Empirical research has also identified that poor sleep impacts on the degree, nature and resolution of interpersonal and relationship conflicts, with severity and frequency of conflict increasing when just one partner within a couple experiences poor sleep (Gordon & Chen, 2014).

Sleep Behaviours

Sleep is multifaceted including functions such as sleep duration, timing, disturbances, and quality, with healthy sleep being characterised by achieving adequate durations as well as

good quality (Buysse, 2014; Chaput et al, 2020). Recommended sleep durations identify healthy sleep requires 7-9 hours of sleep per day for adults aged 18-64 years (Chaput et al, 2020; Hirshkowitz et al. 2015). This recommended sleep duration is reinforced by public health officials, however recent studies have identified chronic sleep deprivation among adults, with 12% of Australian adults (aged 18-64 years) reporting achieving less than 5.5 hours of sleep a night (Adams et al, 2017; Lim et al, 2023). An earlier Australian sleep study identified that reduced sleep durations were associated with various socio-demographic aspects such as lower education levels, long working hours, being single, high rates of smoking and alcohol consumption, obesity, anxiety and depression (Magee et al., 2009). Even with research and public health recommendations reinforcing the importance of sleep, various factors such as work requirements, family, social and lifestyle choices, continue to restrict and degrade sleep (Worley, 2018).

Coupled with required sleep durations, empirical research also identifies sleep timing and sleep-wake consistency are fundamental to overall sleep health and its restorative qualities (Chaput, et al., 2020; Sletten et al., 2023). Sleep timing refers to the time during the day in which individuals prepare for bedtime and ultimately fall asleep (Exelmans & Van den Bulck, 2017). Our consistency of sleep timing is influenced by various external environmental, work, family and social factors, as well as via internal chronobiology. Sleep health recommendations identify a consistent and routine bedtime is ideal to allow for greater sleep health, however while this is widely supported there is limited research in this area (Chaput, et al., 2020; Sletten et al., 2023) and given the various influences on sleep timing may be an unrealistic recommendation. The greatest influence on sleep time consistency is work related, with those working shift work unable to maintain consistent bedtime routines around 24-hour shift cycles. Significant research has investigated the relationship between shift workers and sleep health, across various sleep domains, identifying that on average shift workers achieve

reduced sleep durations and lower sleep quality than non-shift workers (Harrington, 2001; Pedersen et al., 2022).

When considering internal influences chronobiology sleep research identifies our sleep and wake timings are driven by our internal chronological clock, which drives us to be somewhere on the spectrum from an early to late sleeper (Zaki et al., 2020). Research in relation to chronobiology sleep identifies various factors, such as genetics, personality types and age, being associated with where individuals fall on the spectrum (Zaki et al., 2020). However, regardless of if an individual is an early or late sleeper the recommendation is still that consistent sleep-wake timing is more beneficial to overall sleep health (Sletten et al., 2023). However, some research suggests that even consistent sleep timing does not result in overall sleep health when that sleep is achieved contrary to chronobiological needs (Sletten et al., 2023). With a growing body of research indicating circadian misalignment to be associated with various adverse health outcomes, and further studies suggesting irregularities in sleep timings could pose greater health risks than reduced sleep durations (Sletten et al., 2023).

The variability in sleep timings has been identified across various studies to result in reduced sleep durations and poorer sleep quality (Duncan et al., 2016; Sletten et al., 2023). These findings regarding inconsistent sleep-wake timings have also been found to have significant negative health outcomes across several aspects, including lower dietary quality, reduced cardiovascular health and higher resting heart rates, increased alcohol consumption and a more sedentary lifestyle (Duncan et al., 2016; Faust et al., 2020; Sletten et al., 2023). Inconsistent sleep timing has also been linked with increased risk taking and reduced mood states (Lau et al., 2019; 2015; Sletten et al., 2023). However, a recent study identified that while inconsistent sleep schedules are associated with negative health outcomes, that when inadequate sleep durations have occurred over multiple days that catchup sleep have

increased health benefits to offset sleep debt (Sletten et al., 2023) indicating that there is a trade off between sleep debt and sleep consistency needs.

Various studies have identified a relationship between sleep needs not being met and emotional difficulties, negative affect, relationship conflict, and impulsivity (Gordon & Chen, 2014; Vantieghem et al., 2016), therefore understanding the factors associated with reduced sleep can assist with our understanding of sleep health and developing coping mechanisms to effectively manage the adverse effects of not achieving recommended sleep needs. This increased public awareness and concern over sleep implications has resulted in a demand for sleep health promotion strategies, known as sleep hygiene strategies, for use by the general population outside of clinical sleep disorder treatments (Irish et al., 2015). Sleep hygiene refers to a collection of recommendations that are seen to promote healthy sleep. These recommendations include both behavioural and environmental aspects, including avoidance of caffeine, nicotine and alcohol in the hours prior to bedtime, regular exercise and exposure to natural daylight, maintenance of a regular sleep schedule, and a sleeping environment that is both noise and temperature controlled (Irish et al., 2015). With research showing a general association between sleep hygiene recommendations and increased sleep durations and quality (Irish et al., 2015; Scott et al., 2021).

Dark Tetrad

The dark tetrad, also known as the dark quad, refers to a group of identified dark personality traits consisting of Machiavellianism (MAC), narcissism (NAR), psychopathy (PSY) and sadism (SAD). The four traits create a constellation of both distinct but also overlapping and interrelated domains in personality and behaviours, with a common core of callous manipulation present. These personality traits are seen to be correlated towards a disposition towards antisocial, amoral, or maladaptive and harmful behaviour towards others, and are seen as the darker side or a dark core of personality. Various studies have identified

callousness as a common core characteristic across all the dark tetrad traits, along with low levels of empathy and emotional regulation (Erickson & Sagarin, 2021; Lee, 2019; Ziegler-Hill & Vonk, 2015).

In the early 2000s researchers combined identified darker personality traits, collectively calling them the dark triad which included MAC, NAR, and PSY (Paulhus & Williams, 2002). Various research studies linked these dark triad traits to various psychology and sociology disciplines (Furnham & Horne, 2021). The addition of SAD moves us from the dark triad and into the dark tetrad, which while previously having been acknowledge as a darker side of personality had not been seen as distinct trait and instead as a common factor across those already identified in the dark triad (Paulhus et al., 2021). However, SAD as a trait has garnered substantial research interest both in clinical and non-clinical populations (Paulhus et al., 2021). To date much of the research conducted relating to darker personality traits has involved the Dark Triad, excluding SAD, however research is now growing in the dark tetrad field.

The dark tetrad traits are seen as being dimensional, that is individuals differ in the degree of the trait but there is no identifiable threshold to reliably delineate someone from being a MAC, NAR, PSY or SAD to not being one (Beller & Bosse, 2017; Foster & Campbell, 2007; Walters, 2014). This means all individuals possess the capacity to manipulate, exploit or control others for their own gain, and it is only the degree to which these behaviours are undertaken to achieve personal goals that identifies someone's level or degree of darker personality traits. Research also indicates dark traits are strongly positively interrelated and variances in large degrees may be explained by other personality models, such as the Five-Factor model and the HEXACO honesty-humility factor (Gómez-Leal et al., 2020; Paulhus & Williams, 2002).

Research indicates that the darker traits have a relationship with other basic personality dimensions, investigating connections between dark traits and personality models of HEXACO and the Big Five personality dimensions. With several studies identifying negative correlations for MAC, NAR, PSY and SAD with the honesty-humility trait of HEXACO and negative correlations with agreeableness and emotionality on the Big Five model (Gómez-Leal et al., 2020; Paulhus & Williams, 2002). In fact, Mededovic 2012 identified MAC, PSY and SAD fitted at the absolute negative end of the honesty-humility dimension to such an extent as to create a discrete dishonesty factor (Mededovic, 2012).

While these darker side of personality traits have been researched across various psychological disciplines they are not seen as clinical personality disorders. Rather the dark tetrad traits, and assessment measures for them, are intended to assess the degree to which the underlying maladaptive, manipulative, or dysfunctional interpersonal personality themes exist. These traits can be seen as self-defeating social and interpersonal expressions of normal personality, and at most as a sub-clinical manifestations of personality disorders of similar names, such as narcissistic and sadistic personality disorders (Furnham & Horne, 2021).

Machiavellianism

Machiavellianism (MAC) as a trait is characterised as displaying longer term manipulative, cynical and amoral behaviours towards others for protective or personal benefits (Sabouri et al., 2016). MAC tends to display as actions aimed to help promote self-interests through manipulation, scepticism, and flattery (Collision et al., 2018). Overall individuals with Machiavellianism traits appear more hypocritical, manipulative and superficial but present as being charming and impressive (Jakobwitz & Egan, 2006; Sabouri et al., 2016). Within the Big Five personality model, the MAC trait is associated with low agreeableness and conscientiousness (Paulhus & Williams, 2002).

Narcissism

Narcissism (NAR) trait is displayed as an entitlement pattern of behaviours, with a self-absorption focus and valuing self above others (Sabouri et al., 2016). Individuals often display NAR through grandiosity, arrogant and exhibitionistic behaviours (Glover et al., 2012).

While NAR overlaps with the core darker traits it is the one with the lowest level of congruence to the other dark tetrad traits. Studies identify NAR having a positive correlation with emotional intelligence, as opposed to negative correlations between emotional intelligence PSY and MAC (Paulhus et al., 2021). Also, while NAR and PSY both exhibit impulsivity and aggressive behaviours, the triggers for these differ in that NAR tends to occur in response to ego-threats, and PSY in response to physical provocation, while MAC displays no relationship to impulsivity (Jones & Paulhus, 2010, 2011).

Unlike the other dark tetrad traits NAR is the one trait not positively correlated with aggressive behaviour, such as cruelty, radicalisation, leading to aggressive punishment of others (Bonfa-Araujo et al., 2022). While there tending to be a lack of correlation between NAR and violent aggressive behaviours, some studies still identify a link to lighter forms of aggression such as using emotional manipulation through brainteasers in selection processes (Highhouse et al., 2018).

Psychopathy

Psychopathy (PSY) is characterised by more impulsive, aggressive, and malevolent social behaviours (Gómez-Leal et al., 2020). Individuals with a higher degree of PSY tend to display more impulsive and non-empathic behaviours, with a tendency towards antisocial behaviour (Patrick, 2018). Similarly to MAC within the Big Five personality model, the PSY trait is associated with low agreeableness and conscientiousness (Gómez-Leal et al., 2020).

There is a higher correlation between PSY and the MAC and SAD traits than when compared to NAR (Vize et al., 2016). Of all the dark tetrad traits PSY is often seen as the most aversive and antisocial of all traits.

Sadism

Sadism (SAD) the trait addition creating the dark tetrad, presents as the enjoyment of harming others or seeing others suffering, in relation to both physical and emotional pain (Gómez-Leal et al., 2020). The non-clinical SAD trait within the dark tetrad is at times referred to as everyday sadism, to differentiate it from clinical disorders or clinical diagnostic measures (Bonfa-Araujo et al., 2022). This everyday SAD trait can be observed as individuals enjoying violent movies, shows and games as a form of social escapism as a manifestation of their sadistic traits (Buckels et al., 2013). Individuals with a higher degree of SAD trait are inspired by a hedonic value of cruelty, associated with inflicting verbal, physical or emotional injury and pain on others (Buckels et al., 2013). SAD has been identified as an influencer to cyber-trolling behaviour and linked to pleasure garnered from engaging in online intimidation actions (Bonfa-Araujo et al., 2022).

SAD shares similarities with PSY as they share the common characteristics of lacking empathy and emotional connectivity, pleasure inflicting suffering and antisocial behaviours (Gómez-Leal et al., 2020). While there is correlation between SAD and PSY, they are also distinct traits, with research identify SAD as opposed to PSY is more predictive of unprovoked aggression (Reidy et al., 2011), delinquent behaviour in high school students (Chabrol et al., 2009) and a predictor of criminal recidivism than PSY traits (Mededovic et al., 2012). Meta-analysis has indicated SAD is more comparable and connected to PSY and MAC than to NAR, while also indicating that within the dark tetrad traits SAD, PSY and MAC represent the most extreme features of darker trait behaviours (Bonfa-Araujo et al., 2022).

Dark Tetrad and Empirical Research

Empirical research has identified that several personality factors have a negative relationship with sleep, this has been seen at higher level personality traits within the Big Five as well as within dark tetrad personality traits. Given previous sleep research having identified a close association between sleep and emotional difficulties including poorer emotional regulation, increased impulsivity, aggression and risk taking, reduced empathy and self-control (Sabouri et al., 2016), there appears to be an overlap between dark tetrad personality behaviours and sleep.

Empirical research has found associations between dark tetrad traits and evening chronotypes indicating a predisposition towards later bedtimes (Jonason et al., 2013; Rahafar et al., 2017), increased sleep disturbances and poorer sleep (Sabouri et al., 2016). With findings indicating that Machiavellianism and psychopathy traits were more strongly associated with sleep disturbances and poor sleep quality than narcissism (Sabouri et al., 2016; Yang et al., 2019). Whereas other studies have identified that the psychopathy as the most related trait associated with later sleep timings and poorer sleep quality (Rahafar et al., 2022; Zamani Sani et al., 2023). Studies in relation to narcissism and sleep have returned conflicting findings, with some indicating a positive association to sleep disturbances (Ellison et al., 2013) and others indicating no association (Sabouri et al., 2016).

Theoretical frameworks also support the association between sleep and psychological functioning influenced by dark tetrad personality traits. With theoretical proponents positing sleep disturbances are both caused and maintained by dysfunctional emotional processing, inadequate problem-solving, rumination and worry (Reimann et al., 2010; Sabouri et al., 2016).

Current research

The aim of this research is to explore the associations between dark tetrad personality traits and sleep behaviours in adults aged 18-64 years. Furthermore, in this study, we aim to examine the self-reported behaviours of sleep duration, sleep disturbances, and sleep/wake timing consistency or stability to potentially identify associations between dark tetrad personality traits and sleep behaviour measures. With this research looking to answer the questions of how are self-reported aspects of dark tetrad personality traits associated with sleep behaviours consisting of sleep duration, sleep/wake consistency, and sleep quality? And do specific dark tetrad personality traits have a greater relationship to sleep behaviours than others?

Based on current research findings, we raise three hypotheses: (H1) a positive association between dark tetrad personality traits with later bedtimes, (H2) a negative association between DT personality traits and the sleep behaviours of sleep/wake consistency, duration, and quality, and (H3) finally, it is hypothesised a stronger association between Machiavellianism, psychopathy and sadism with sleep disturbances than narcissism and positive correlations to sleep hygiene.

Chapter 2: Method

Participants

Participants were sourced via convenience sampling through email, social networking, and university advertisement on the psychology undergraduate research portal. Participation was voluntary and incentivised via entry into a prize draw for one of three gift cards, being one card of the value $100 AUD and two valued at $50 AUD, at completion of the survey. The only eligibility criteria for participating were participants had to be aged between 18 and 64 years. Ethical approval was attained from the University of Southern Queensland Human Ethics Committee prior to commencement of recruitment (ETH2024-0494).

A total of 122 participants completed the study. Participants were aged 18 to 64 years old (*M* = 20-29 years), with the majority being female (76%). Participants were mainly University degree educated (81%), employed fulltime (47%) and were non-shift workers (68%). Refer to Table 1 for a breakdown of participants demographic characteristics.

Table 1

Sociodemographic Characteristics of Participants

Characteristic	*N*	%
Gender		
Female	92	76
Male	28	23
Non-binary, fluid or other	1	1
Age		
18-19 years	1	0.8
20-29 years	40	33.1

30-39 years	23	19.0
40-49 years	34	28.1
50-59 years	18	14.9
60-64 years	5	4.1
Highest level of education		
None	1	0.8
Secondary/High school	6	5.0
Trade or TAFE qualification	16	13.2
University undergraduate degree	49	40.5
University postgraduate degree	49	40.5
Employment Status		
Casual	17	14.0
Part time	33	27.3
Full time	58	47.9
Student	11	9.1
Not employed	2	1.7
Shiftwork Status		
Non-shift worker	82	67.8
Routine shift worker	22	18.2
Permanent night shift worker	4	3.3
Not currently employed	13	10.7

Note: $N = 121$.

Study Design

The study was a quantitative cross-sectional correlational design that utilised an online survey to collect data. Demographic data consisting of age, gender, highest level of education achieved, employment and shift working status was collected.

Our predictors variables of dark tetrad traits being narcissism, psychopathy, Machiavellianism, and sadism, were measured on a scale basis using the short dark tetrad (SD4) measure. Our criterion variables of sleep behaviours consisting of sleep duration, sleep/wake timings and consistency, and sleep quality, were measured on a scale basis using the sleep timing questionnaire (STQ) and the Pittsburgh sleep quality index (PSQI). While our control variable of sleep habits was measured on a scale basis using the Sleep Hygiene Index (SHI).

A *priori* power analysis was completed using G*Power version 3.1.9.7 to determine an appropriate sample size for the study (Faul et al., 2007). A power analysis was performed to estimate the minimum sample size needed. In total, 153 participants would be needed to detect a small-moderate effect size of 0.2, with an alpha level of .05 and power of .8 using a one-tailed bivariate correlation analysis. A further power analysis identified 155 participants would be needed to detect a small-medium effect size (f^2) of .08, with a power level of .80 and a p value of .05, with four predictors in the regression model. Therefore, under these parameters, the current sample size of 121 is considered underpowered and results will need to be interpreted with this in mind.

Materials

The online survey used was created within the University of Southern Queensland Survey Tool.

Short Dark Tetrad

To measure individuals' level of narcissism, psychopathy, Machiavellianism, and sadism traits we used the Short Dark Tetrad (SD4; Paulhus et al., 2021) scale. Comprising 28-items, with four subscales to evaluate each trait, each subscale contains 7 items rated on a 5-point scale (1 = strongly disagree to 5 = strongly agree). Responses can be averaged (range: 1–5) or summed (range: 7–35 for individual traits, and 28–140 for the SD4 total score). With higher scores, both in total scores and subscales, indicating greater levels of the specific dark personality trait (Paulhus et al., 2021). Invariance testing indicates the SD4 items discriminate equally across genders in identifying individual's variance in dark personality features and subscale scores reflect latent levels of traits between men and women (Neumann, C. et al., 2022). The SD4 has demonstrated the four subscales show distinctive correlates and construct validity (Paulhus et al., 2021), with estimations of reliability ranged from Cronbach's α = .63 to .78 (Blötner et al., 2023).

Sleep Timing Questionnaire

The sleep timing questionnaire (STQ; Monk et al., 2003) was used to obtain measures of individual's typical sleep schedules and estimated stability. The STQ consists of 18 items, covering bedtime and waketime preferences, frequency and length of nighttime awakenings, and sleep schedule stability. Respondents provide estimates of earliest, latest, and typical bed and wake times across both weekends and work nights and estimates in 15 minute increments of schedule stability. Which returns an overall estimated metric of bedtime/waketime stability. The STQ has demonstrated test-retest reliability ranging from .71 to .83, a correlation validity of .59 to .77 and .84 to .86 between other sleep timing measures of actigraphy and sleep diaries (Monk et al., 2003).

Pittsburgh Sleep Quality Index

Sleep disturbance and sleep quality was measured using Pittsburgh Sleep Quality Index (PSQI; Buyse et al., 1989) self-report measure, comprising 19-items, four assessing quantitative sleep aspects and the remaining assessing frequency of sleep disturbances over the past month. Individual items generate seven component scores which together yield a global score of sleep quality using the formula provided by Buyse and colleagues (1989) in their original published PSQI article, with higher scores indicating greater levels of sleep disturbance (Mollayveva et al., 2016). The PSQI has demonstrated good validity and reliability in both nonclinical and clinical populations and is significantly correlated with actigraphy sleep duration and impairments, and reliability both within and between groups consisting of Cronbach's alpha ranging from $\alpha = .70$ to .83 (Etain et al., 2021; Mollayveva et al., 2016).

Sleep Hygiene Index

The sleep hygiene index (SHI; Mastin et al., 2006) is a 13-item scale used to assess the presence of behaviours thought to comprise sleep hygiene. Participants indicate how frequently they engage in specific behaviours across a 5-point scale (ranging from 1 = always to 5 = never). Scoring of items is summed to provide a global assessment of sleep hygiene, with higher scores indicating more maladaptive sleep hygiene. The SHI item constructs are derived from inadequate sleep hygiene diagnostic criteria contained within the International Classification of Sleep Disorders (Thorpy, 2017). The SHI has demonstrated good test-retest reliability ($r = 0.71$) and internal consistency. The SHI is also positively correlated with validated sleep measures and all associated features of inadequate sleep quality with Pearson r values ranging from 0.371 to 0.458 (Mastin et al., 2006).

Procedure

Participants were recruited using social media, emails and university advertisements, which included a brief overview of the research, and a hyperlink to the survey. The initial page of the survey contained information about the study, covering aims of the research, incentives, and confidentiality. Participants were then asked to give explicit consent by clicking “I agree” to signify they had read and understood the participant information and agreed to participate in the research. Participants were advised they were free to withdraw at any stage by exiting the survey prior to the final submission. The survey took approximately 25 minutes to complete.

After consenting, participants were presented with the demographic questions first before they proceeded to complete the Short Dark Tetrad related questions to screen for dark tetrad personality traits. From there the three sleep related measures were presented in the order of the Sleep Timing Questionnaire, the Pittsburgh Sleep Quality Index, and the Sleep Hygiene Index. All data collection and storage complied with the University of Southern Queensland’s Research Data and Primary Materials Management Procedure. Data will be retained and disposed of in compliance with Australian Code for the Responsible Conduct of Research.

Analytic Strategy

Data were analysed using IBM SPSS Statistics, version 29. All data collected from the survey was screened for missing and unusual data prior to analysis for assumption testing. Alpha level was set at .05 for all probability testing.

Firstly, to address hypotheses one and two we used Pearson's bivariate correlation analyses to calculate associations between each of the dark tetrad personality traits, and sleep timing, duration, and consistency variables. Secondly for hypotheses three testing, to

calculate to what extent the different dark tetrad personality traits had greater association with sleep behaviours of sleep disturbances and sleep/wake consistency, we used a multiple regression analysis. A Pearson's bivariate correlation was also used to identify if sleep hygiene correlated to the dark tetrad personality traits, to then be controlled for in the multiple regression analysis. This would entail adding the sleep hygiene index variable at step one and then the dark tetrad personality traits.

Chapter 3: Results

Data Screening

Data was collected over a 6-week period, July to August, through the UniSQ Survey Tool. In total 155 participants commenced the survey, however 33 did not complete the survey or withdrew consent prior to final submission. Data from the 122 completed survey participants was downloaded from the UniSQ Survey Tool into Microsoft Excel for initial screening for ineligible participants and potential erroneous bot activity. This initial screening identified one participant outside of the required age range (18-64 years) and was removed from the data set for analysis. Bot screening consisted of cross-checking several sleep question responses that are repeated between measures for erroneous responses, as well as a demographics confirmation question. This screening identified that none of the remaining 121 participants appeared to be from computer bot activity.

Data Handling

Prior to importing data into SPSS for analysis participants free text responses in relation to sleep timings and sleep hours were manually converted. With sleep timings being converted into 24-hour measurements for consistency and sleep hours changed into numerical values. Where participants answered sleep questions with a time range instead of a set time, the middle range was taken as the transformed value (i.e., usual bedtime response of 5-9pm was transformed to be 1900).

To calculate participants usual bedtime from STQ responses a weighting was applied to work and non-workday bedtime responses, consisting of a 5:2 weighting, in accordance with STQ guidance (Monk et al., 2003). This resulted in usual sleep timing responses ranging from 1900 to 0500. Given the wide range of usual bedtime responses and small number of responses in outlier times, when data was imported into SPSS usual bedtime ranges were

converted into usual bedtime groups. This resulted in usual bedtime being grouped as follows, group 0: 1900-2059, 1: 2100-2259, 2: 2300-2459, 3: 0100-0500.

Assumption Testing

Assumption testing was performed for all variables and statistical analyses. For correlation analyses, the assumption of independence was met through our study design. Normality of all dark tetrad and sleep behaviour variables was initially assessed using the Kolmogorov-Smirnov statistic, as recommended for in samples >50 (Mishra et al., 2019). The Kolmogorov-Smirnov statistic for Machiavellianism, psychopathy, sadism, sleep-wake consistency, sleep timing, and sleep duration variables were significant, indicating violation of normality. Further visual inspection of histograms and normal and detrended Q-Q plots confirmed non-normality. Proceeding to inspections of scatterplots to determine linearity and homoscedasticity, it was identified variables also did not meet the assumption of linearity.

Given the normality and linearity violations a review was undertaken for outliers using z-scores and visual inspection of boxplots. Z-score conversions indicate that for Machiavellianism, psychopathy, sadism, sleep-wake consistency, sleep timing, and sleep duration variables all fell within the normal range of around 95% (Field, 2018). With all variables returning absolute values of z-scores indicating no more than 3.5% were greater than 1.96, meaning we can assume that the data is not being overly influenced by outliers and may appear normally distributed.

Given z-score transformation, with outliers not being identified as extreme, meaning trimming the data to remove outliers is not considered appropriate to overcome non-normality and linearity (Field, 2018). Rather consideration was made to possibly transform the data or to instead analyse the data through robust means to overcome normality and linearity violations. Given the degree of non-normality and linearity across several variables, this would result in several variables requiring to be transformed. This brings into question

the validity of the data for analysis, with implications for data interpretation and the potential consequence of applying transformation to the extent the data being analysed is no longer representative of the data collected (Field, 2018; Grayson, 2004).

Instead considering the assumption violations across several variables it was determined the most appropriate outcome for our data would be to use a non-parametric statistical analysis method that is robust and unaffected by these assumptions (Field, 2018). Given this the Kendall's tau-b correlation was adopted as the non-parametric alternative to Pearsons bivariate correlation and was used for all correlation analyses (Allen & Bennett, 2018). The Kendall's tau-b correlation, as opposed to the Spearman's rho, was selected as it has been seen to provide a better estimate of true population correlation, and to not be artificially influenced by multiple tied ranks (Allen & Bennett, 2018).

Unfortunately, by moving to non-parametric analysis this means we were unable to conduct a multiple regression analysis to assess hypotheses three. However, we elected to conduct a Kendall's tau-b correlation analysis between the dark tetrad personality traits and sleep hygiene variables. Even though we would not be using this as a control variable within a multiple regression analysis, as it was decided to still be relevant to overall sleep behaviour associations.

Descriptive Statistics

Descriptive statistics consisting of means, standard deviations and data range, for the dark tetrad personality traits and sleep behaviour variables were analysed, as presented in Table 2. In relation to the dark tetrad personality traits, as per the SD4 measure each of these four variables had potential mean scores of between zero and five. The data indicates that participants had higher scores relating to Machiavellianism (M = 3.13, SD = .65) comparative

to narcissism (*M* = 2.75, *SD* = .67), psychopathy (*M* = 2.04, *SD* = .72) and sadism (*M* = 2.01, *SD* = .77).

In relation to sleep behaviours, high levels of standard deviations and large ranges in the data were seen for the variables of sleep-wake consistency (*M* = 18.46, *SD* = 11.56), sleep quality (*M* = 7.79, *SD* = 3.43), and sleep hygiene (*M* = 32.61, *SD* = 6.65). With more moderate standard deviations identified for sleep timing (*M* = 21:30, *SD* = .49) and sleep duration (*M* = 8.50, *SD* = 1.36), even with large data ranges again being present.

Table 2

Descriptive Statistics of Variables

Variable	*M*	*SD*	Median	Range
MAC	3.13	.65	3.14	1.14 - 5.00
NAR	2.75	.67	2.72	1.29 – 4.57
PSY	2.04	.72	1.86	1.00 – 4.71
SAD	2.01	.77	1.86	.86 – 4.00
Sleep Timing	21:30	.49	22:30	19:00 - 05:00
Sleep Duration	8.50	1.36	8.5	4.50 - 12.00
Sleep-Wake Consistency	18.46	11.56	15.86	.86 – 42.29
Sleep Quality	7.79	3.43	8.00	2.00 – 19.00
Sleep Hygiene	32.61	6.65	32.00	19.00 – 49.00

Note: *N* = 121.

Hypothesis Testing

To determine the associations between each of the dark tetrad traits and sleep behaviour variables, Kendall's tau-b correlations were performed, as shown in Table 3. Kendall's tau-b found significant results with a positive medium correlation between the

psychopathy dark tetrad trait and unstable sleep-wake consistency (τ = .14, p = .03), and a positive medium correlation between psychopathy and later bedtime (τ = .15, p = .04). Kendall's tau-b also found significant results in relation to sleep hygiene and two of the dark tetrad traits. Indicating a positive medium correlation between Machiavellianism and poorer sleep hygiene (τ = .25, p < .001), and a positive medium correlation between sadism and poorer sleep hygiene (τ = .16, p =.01).

Kendall's tau-b found no significant results for the remaining dark tetrad traits and sleep behaviour variables.

Table 3

Correlations of Variables

Variable	MAC	NAR	PSY	SAD
Sleep Timing	.09	.00	.15*	.14
Sleep Duration	.08	.06	.14	.09
Sleep-Wake Consistency	.06	.01	.14*	.12
Sleep Quality	.12	-.10	.08	.10
Sleep Hygiene	.25**	-.01	.13	.16*

Note: N = 121. *p <.05. **p = <.01

Chapter 4: Discussion

This study aimed to examine self-reported behaviours of sleep duration, disturbances, sleep-wake consistency and sleep hygiene to potentially identify associations between dark tetrad personality traits and broader sleep behaviours. It was hypothesised that all dark tetrad personality traits would have positive associations with later bedtimes, and negative associations with sleep-wake consistency, duration and sleep quality. Our findings only partially supported these two hypotheses. In that we found only the dark tetrad trait of psychopathy was associated with later bedtimes and unstable sleep-wake consistency. However, contrary to expectations none of the dark tetrad personality traits were significantly associated with sleep quality and durations.

Furthermore, we hypothesised a stronger association between Machiavellianism, psychopathy and sadism with sleep disturbances than narcissism and positive correlations to sleep hygiene. Similarly, this hypothesis was also only partially supported. We were able to identify that only two dark tetrad traits, being Machiavellianism and sadism, were positively correlated with poorer sleep hygiene.

While previous research in this area has been limited, we can identify that these results expand on previous research. With our findings in relation to the psychopathy trait association with later bedtimes and inconsistent sleep-wake routines supporting prior findings (Jonason et al., 2013; Rahafar et al., 2017; Rahafar et al., 2022; Zamani Sani et al., 2023). However, our finding of no significant association between the traits of Machiavellianism, and later sleep timings and sleep quality are inconsistent with prior research (Jonason et al., 2013; Rahafar et al., 2017; Sabouri et al., 2016; Yang et al., 2019). Our lack of findings in relation to narcissism and sleep behaviours adds to already conflicting research in this area, with some indicating a positive association to sleep disturbances (Ellison et al., 2013) and others indicating no association (Sabouri et al., 2016).

We were unable to identify any previous research exploring associations between dark tetrad personality traits and sleep hygiene behaviours. Therefore, our findings are the first to demonstrate an association between Machiavellianism and sadism traits and poorer sleep hygiene. While being a first our findings also assist in broadening our current understanding of not only the relationship between sleep behaviours and dark tetrad personality traits but to the broader field of sleep behaviour research.

Strengths, Limitations and Future Directions

Strengths of our research include contributing to the currently limited empirical research and knowledge in relation to the relationship between dark tetrad personality traits and sleep behaviours. While there is a broad empirical and theoretical knowledge abound in relation to sleep behaviours there has previously been very limited empirical research that drills into how individuals' personality traits at the dark tetrad level are associated. An additional strength includes the current study comprehensively examined self-reported sleep behaviours using multiple sleep behaviour measurements. With the use of the PSQI, STQ and SHI we were able to gather a deeper understanding of differing facets of sleep behaviours beyond what several previous studies regarding personality and sleep have evaluated. Using various sleep measures also allowed us to better understand and evaluate sleep timings, durations and disturbances across both workday and no-workday considerations.

However, even with these strengthens our study did have limitations. Firstly, although we used several self-reported measures of sleep, they were subjective self-recall measures, as opposed to objective physiological tracking measures of sleep timing, duration and quality. Previous research has shown there does exist a generalised poor agreement between self-reported and objective measures of sleep, indicating individuals' perceptions of sleep and objective sleep markers are at times not aligned (Cudney, et al., 2022). It is suggested that

future studies could expand on our current research through the incorporation of objective sleep measures, however this was not a possibility within the current study's timeframe.

A second limitation of our research is the size and composition of our participant sample. Given the number of participants (N= 121) our current study was under powered, and this could have also had an impact on the non-normality and linearity of our data. As it has been shown the larger the number of participants within a dataset the more representative it becomes to the overall general population and issues with normality become resolved (Field, 2018). Even considering the underpowered limitation of our study the findings can still be interpreted as relevant, but the effect sizes may not be realistic (Valillo, 2016). However, the composition of our sample is also a limitation, as it included a large portion of university educated individuals (81%). It is possible given the large percentage of university graduates this may have influenced their prior perceptions of sleep behaviours and overall sleep hygiene knowledge. This is especially relevant for psychology graduate students, where sleep health and its implications on mental health and wellbeing is covered within degrees, as such these individuals potentially hold a level of awareness on sleep health beyond that of the general population. Meaning within our sample size we were collecting data from a group of individuals more likely to be aware and potentially have enhance sleep hygiene practises not necessarily representative of the wider population. This limitation, however, is not unique to our study and has previously been raised as a limitation across social science and psychology research projects as being widely prevalent and that caution should be exercised in extending findings beyond university student populations (Peterson, 2001).

Another limitation of our study which future research could look to expand on is our study design being a single point cross-sectional data collection. With the bidirectional nature of sleep and personality traits future research could look to instead have repeated measures of participants to assist in identifying if individual's responses to either sleep behaviours or dark

tetrad personality traits change over time. This could even include an experimental study investing the effects of sleep restriction and associations with dark tetrad personality traits. Given previous research identifies increases in emotional reactivity, risk taking, and negative mood states and decreases in socio-emotional functioning when individuals experience sleep loss (Simon, et al., 2020) this could be expanded on in greater detail in future research to enhance our understanding of the relationship between sleep and darker personality traits. Despite this limitation in our study, our study still presents novel findings in relation to dark tetrad personality traits and various sleep behaviours, especially in relation to sleep hygiene behaviours, building upon current theoretical knowledge and empirical research across these domains.

Conclusion

Given the importance of sleep health on overall health and wellbeing, understanding associations between sleep behaviours and aspects of personality such as dark tetrad traits can provide invaluable knowledge in this field. To date, research efforts to understand implications and influences around sleep health have focused on various external factors or personal motivations. However, through combining theoretical knowledge regarding personality traits and how these may be associated with sleep behaviours is an area of untapped empirical research to date. Findings from this research assists in expanding on our understanding of sleep health and personality traits, suggesting that some aspects of dark tetrad traits are associated with sleep behaviours. Given the bidirectional nature between sleep, emotional reactivity and socio-emotional behaviours, changes in one aspect have the potential to influence the pathology of the other.

Our research builds on current theoretical and empirical knowledge regarding relationships between individuals sleep habits and emotional behaviours. Given prior knowledge that increasing sleep health awareness can assist with not only improving sleep

quality but also emotional and mood behaviours. Couple this with the maladaptive anti-social behaviours exhibited by dark tetrad personalities and the associations with sleep, by increasing sleep health awareness campaigns this has the potential to assist in moderating these more maladaptive antisocial behaviours. This implication not only exists for those who exhibit higher degrees of dark tetrad personality traits, but also those who fall within the moderate ranges as well.

Research indicates dark tetrad traits are dimensional as opposed to static (Tran, et al., 2018), meaning through other influences there is the potential to moderate the degree to which antisocial and callous behaviours are exhibited. Meaning sleep health and hygiene training and awareness programs could be used to target individuals displaying these more maladaptive antisocial behaviours to reduce pathology and aid in broader mental health and wellbeing.

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Appendix A